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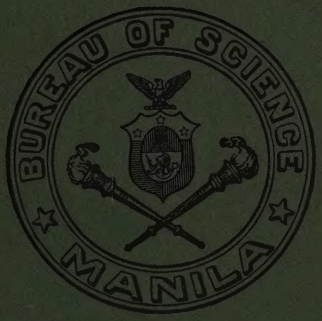

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THE PHILIPPINE
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STUDIES ON PHILIPPINE KINGFISHERS, I

GENUS CEYX

By CANUTO G. MANUEL

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ONE PLATE

In connection with the recording of the birds kept in the collection of the Philippine Bureau of Science, the different groups represented in this collection are being studied. Accordingly, a few papers on Philippine pigeons [1] have been published. While awaiting more material to complete my studies on Philippine pigeons, I have been collecting data on Philippine kingfishers, and the present paper is the first of a series on this group.

The kingfishers form a distinct group of birds characterized by comparatively long, stout, and pointed bill; culmen rounded or slightly flattened; feet weak; fourth toe united with third on its greater length, second, when present, united with third on its basal third. These birds comprise the family Alcedinidæ.

The literature on Philippine kingfishers of the Genus *Ceyx* is scattered through various publications, in a number of which confusion with regard to the position of the birds treated is very apparent. In the present paper an attempt is made to record and discuss the data obtained from first-hand studies of Philippine material, and to correlate these data with those appearing in other publications.

The material upon which the results of the present study are based is in the collection of birds of the Philippine Bureau of Science, Manila.

[1] Philip. Journ. Sci. 59 (1936) 289–305, 327–336; 60 (1936) 157–163, 407–419; 63 (1937) 175–184.

A new race of *Ceyx erithacus* is described.

I wish to express here my gratitude to the Raffles Museum at Singapore through its acting Director, M. W. F. Tweedie, for the specimens lent me for comparison with Philippine material.

Genus CEYX Lacépède, 1799

Brightly colored three-toed kingfishers; tail short and rounded; bill not grooved; culmen straight, slightly flattened at base; first primary reaching nearly to tips of longest quills.

Six species of the genus occurring in the Philippines are herein treated.

Key to the species of Ceyx.

a^1. Largely black above ..... *C. argentatus.*
a^2. Not black above.
  b^1. Breast with a blue area ..... *C. cyanopectus.*
  b^2. Breast without a blue area.
    c^1. Upperside largely blue ..... *C. lepidus.*
    c^2. Upperside largely rufous.
      d^1. Underside lilac-rufous ..... *C. melanurus.*
      d^2. Underside yellow.
        e^1. With a blue ear patch ..... *C. erithacus.*
        e^2. Without a blue ear patch ..... *C. rufidorsus.*

Species 1. CEYX ARGENTATUS

Largely black above, with big silvery white spots; chin, throat, and forebreast occasionally with a buffish wash; rest of underparts black, with a hue of blue; bill black.

CEYX ARGENTATUS ARGENTATUS Tweeddale.

Ceyx argentata TWEEDDALE, Ann. & Mag. Nat. Hist. IV 20 (1877) 533.

Alcyone cyanopecta MCGREGOR and WORCESTER, Hand-list Bds. Philip. Is. (1906) 52.

Ceyx argentatus argentatus HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 132.

Basilan, Dinagat, Mindanao.

Specimens from Mindanao were examined.

Measurements of Ceyx argentatus argentatus, based on fifteen males and eleven females.

	Extremes. mm.	mode. mm.
Wing	58–65	61
Tail	22–27	24
Culmen from nostril	30–35	33
Tarsus	7– 9	8
Middle toe and claw	15–17	17

The black area below has a hue of Berlin blue on breast and sides of abdomen.

CEYX ARGENTATUS FLUMENICOLUS Steere.

Ceyx flumenicola STEERE, List Birds and Mammals Steere Exped. (1890) 10.
Alcyone flumenicola MCGREGOR and WORCESTER, Hand-list Bds. Philip. Is. (1906) 53.
Ceyx argentatus flumenicolus HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 133.

Leyte and Samar.

Specimens from Leyte and Samar were examined.

Measurements of Ceyx argentatus flumenicolus, based on fourteen males and five females.

	Extremes. mm.	mode. mm.
Wing	56–61	58
Tail	20–24	23
Culmen from nostril	29–32	30
Tarsus	7– 9	8
Middle toe and claw	15–17	16

The black area on breast and sides of abdomen has an azurite blue wash.

Species 2. CEYX CYANOPECTUS

General color of upper surface blue; head and secondary coverts spotted with cobalt; back, rump, and upper tail coverts cobalt; underside largely reddish buff with at least (female) an incomplete band of blue on breast. Male with two blue bands on breast which meet on sides, enclosing a semicircular reddish buff area.

CEYX CYANOPECTUS CYANOPECTUS Lafresnaye.

Ceyx cyanopectus LAFRESNAYE, Rev. Zool. (Soc. Cuv.) 3 (1840) 33.
Alcyone cyanopectus JARDINE, Contrib. Ornith. (1850) 82.
Alcyone cincta JARDINE, Contrib. Ornith. (1850) 82, pl. only.
Ceyx philippinensis GOULD, Proc. Zool. Soc. London (1868) 404.
Ceyx steerii SHARPE, Cat. Bds. Brit. Mus. 17 (1892) 187.
Ceyx cyanopectus cyanopectus HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 127.

Luzon, Marinduque, Masbate, Mindoro, Polillo, Sibuyan, Ticao.

Specimens from these islands were examined.

Measurements of Ceyx cyanopectus cyanopectus, based on twenty-seven males and twenty-one females.

	Extremes. mm.	Mode. mm.
Wing	58–62	60
Tail	21–23	23
Culmen from nostril	29–34	32
Tarsus	8– 9	8
Middle toe and claw	16–18	17

Closely resembles *Ceyx cyanopectus nigrirostris*, from which it may be distinguished in having a lighter tint of buff below, a red lower mandible, and smaller spots of cobalt on head and hind neck.

CEYX CYANOPECTUS NIGRIROSTRIS Bourns and Worcester.

Ceyx nigrirostris BOURNS and WORCESTER, Minn. Acad. Nat. Sci. Occ. Papers 1 (1894) 94.

Alcyone nigrirostris MCGREGOR and WORCESTER, Hand-list Bds. Philip. Is. (1906) 53.

Ceyx cyanopectus nigrirostris HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 128.

Measurements of Ceyx cyanopectus nigrirostris, based on one male and one female, respectively.

	Male. mm.	Female. mm.
Wing	58	58
Tail	23	23
Culmen from nostril	30	30
Tarsus	8	8
Middle toe and claw	16	17

This race may be confused with its closest ally, *Ceyx cyanopectus cyanopectus*, from which it is easily distinguished by its entirely black bill, larger spots of cobalt on head and hind neck, and darker buff on underside.

Species 3. CEYX LEPIDUS

CEYX LEPIDUS MARGARETHÆ Blasius.

Ceyx margarethæ BLASIUS, Braunschweigischer Anzeiger (April 15, 1890).

Ceyx suluensis BLASIUS, Journ. für. Orn. (1890) 141.

Ceyx bournsi STEERE, List Birds and Mamm. Steere Exped. Philippines (1890) 11.

Ceyx Malamaui STEERE, ibid.

Banton, Basilan, Bongao, Cebu, Mindanao, Negros, Romblon, Sibuyan, Siquijor, Sulu, Tablas, Tawitawi.

Specimens from Basilan and Negros were examined.

Measurements of Ceyx lepidus margarethæ, based on two females from Basilan and Negros, respectively.

	mm.	mm.
Wing	64	62
Tail	22	22
Culmen from nostril	28	
Tarsus	8	8
Middle toe and claw	16	16

Upper surface with a base color of black; on head and neck this color almost entirely and evenly covered with spots of ultramarine, at tip of each feather; wing coverts, back, rump, and tail irregularly washed with ultramarine; lores, sides of throat, and underparts, except chin, throat, and midabdomen, orange rufous; chin and throat white, washed with orange; bill and feet coral red.

In allying *C. margarethæ* with *C. lepidus* I am following Hachisuka's arrangement, corroborated by descriptions in available literature, principally that by Sharpe;[2] I regret that a specimen of *Ceyx lepidus lepidus* has not been examined.

No specimen of *Ceyx goodfellowi* Ogilvie-Grant, which Hachisuka referred as another subspecies of *C. lepidus*, has been examined.

Species 4. CEYX MELANURUS

Above largely rufous, deeper shaded than under surface; head spotted with lilac; eyelid black greatly developed on anterior half; ear coverts rufous, with a white spot behind; quills black; chin and throat white; bill and feet scarlet.

CEYX MELANURUS MELANURUS Kaup.

Ceyx melanura KAUP, Fam. Eisv. (1848) 15.
Ceyx melanurus melanurus HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 130.

Luzon, Polillo.

Specimens from Alabat, Luzon, and Polillo were examined.

Measurements of Ceyx melanurus melanurus, based on three males and six females.

	Extremes. mm.	Mode. mm.
Wing	53–56	55
Tail	19–21	19
Culmen from nostril	25–31	29
Tarsus	7– 8	8
Middle toe and claw	15–16	16

[2] Catalogue of Birds I 17 (1892).

Breast and flanks rufous with a sheen of lilac, spots of lilac on head indistinct, wing coverts spotted with blue-violet.

CEYX MELANURUS SAMARENSIS Steere.

Ceyx samarensis STEERE, List Birds and Mammals Steere Exped. (1890) 10.

Ceyx melanurus samarensis HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 130.

Leyte, Samar.

Specimens from these islands were examined.

Measurements of Ceyx melanurus samarensis, based on one male from Leyte and one female from Samar, respectively.

	Male. mm.	Female. mm.
Wing	60	60
Tail	21	21
Culmen from nostril	29	26
Tarsus	8	8
Middle toe and claw	15	15

Spots of lilac on head indistinct; blue-violet spots on wing coverts larger than in *C. m. melanurus;* breast and upper abdomen deep rufous, like back, washed with lilac in male; lighter with yellow hue in female.

CEYX MELANURUS MINDANENSIS Steere.

Ceyx melanura SHARPE, Trans. Linn. Soc. London pt. 6 1 (1877) 317.

Ceyx mindanensis STEERE, List Birds and Mammals Steere Exped. (1890) 10.

Ceyx basilanica STEERE, ibid.

Ceyx platensæ BLASIUS, Journ. für. Orn. (1890) 148.

Ceyx melanurus mindanensis HACHISUKA, Bds. Philip. Is. pt. 3 (1934) 131.

Basilan, Mindanao.

Specimens from Basilan and Mindanao were examined.

Measurements of Ceyx melanurus mindanensis, based on three males and four females.

	Extremes. mm.	mode. mm.
Wing	57–60	60
Tail	20–21	20
Culmen from nostril	31–33	32
Tarsus	8– 9	8
Middle toe and claw	16–18	17

Spots of lilac on head heavy, spots of lilac on wing coverts replacing blue-violet of *C. m. melanurus* and *C. m. samarensis;* color of under parts as in *C. m. melanurus.*

Species 5. CEYX ERITHACUS

In the examination of kingfishers in the collection of birds of the Bureau of Science, Manila, two specimens of red-backed three-toed kingfishers from Mindoro were noted to have a blue ear patch which is absent in those obtained in Busuanga and Palawan. This and other characters prove it to be a new race of *Ceyx erithacus,* which I propose to call:

CEYX ERITHACUS VARGASI subsp. nov. Plate 1.

Type.—Adult female, Bur. Sci. 1733, Puerto Galera, Mindoro, Philippine Islands, November 26, 1902, *R. C. McGregor and Andres Celestino.*

From *Ceyx rufidorsus* Strickland, of Borneo, North Natuna, Palawan, and Busuanga this species differs in having two black frontal spots, one on either side of the culmen, a much larger blue patch above the ear coverts, and black scapulars, but some of the black scapulars on the surface are washed with blue. It closely resembles *Ceyx erithacus motleyi* Chasen and Kloss, but its mantle has only a light tint of lilac and its scapulars have less blue.

The measurements in millimeters of the holotype and the paratype, respectively, are as follows: Wing 55, 59; tail 22, 23; culmen from nostril 30, 32; tarsus 8, 8; middle toe and claw 17, 16.

MATERIAL

Ceyx rufidorsus rufidorsus: 2 males and 2 females from Borneo; 1 male from N. Natuna; 2 males and 2 females from Palawan; 2 males and 1 female from Busuanga. *Ceyx erithacus erithacus:* 1 male and 1 female from Singapore; 1 male from Kuala Lumpur and 1 female from Negri Sembilan, Pahang Border. *Ceyx erithacus motleyi:* 2 males (type and paratype), 2 females from Bettotan, near Sandakan, Borneo, and 2 females from Mount Kinabalu.

Ceyx rufidorsus (= *C. eurythra*) was reported from Mindoro by Hartert (1891) and by Worcester and Bourns (1898). McGregor and Celestino also collected a bird which the former identified as *C. eurythra.* That bird is the holotype of the new race under consideration. The confusion arising from the original descriptions of *C. erithacus* (= *C. tridactyla*) and of *C. rufidorsus* which was noted by Strickland (1846) and later by Hartert (1902) may have mislead many ornithologists including Hartert (1891) himself, Worcester and Bourns (1898), and McGregor in identifying the Mindoro form.

I take pleasure in naming this bird for the Honorable Jorge B. Vargas, whose interest is largely responsible for the furtherance of studies on Philippine birds.

Species 6. CEYX RUFIDORSUS

CEYX RUFIDORSUS RUFIDORSUS Strickland.

Ceyx rufidorsus SHARPE, Ibis (1884) 318.
Ceyx eurythra SHARPE, Cat. Bds. Brit. Mus. 17 (1892) 179.

Balabac, Bongao, Calamianes, Mindoro, Palawan, Tawitawi. Specimens were examined from Busuanga and Palawan.

Measurements of Ceyx rufidorsus rufidorsus, based on four males and three females.

	Extremes. mm.	mode. mm.
Wing	57–61	57 (58)
Tail	21–23	23
Culmen from nostril	30–31	30
Tarsus	8	8
Middle toe and claw	17	17

Deep rufous above, with lilac wash very prominent on head, back, and rump. Underparts lemon-yellow, with a shade of rufous; chin and throat white, with lemon-yellow hue.

The papers of Laubmann (1924, 1931) and of Chasen and Kloss (1929) are important in the determination of *Ceyx erithacus*, *C. rufidorsus*, and other forms of the Genus *Ceyx*.

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ILLUSTRATION

PLATE 1. *Ceyx erithacus vargasi* subsp. nov.

PLATE. 1. CEYX ERITHACUS VARGASI SUBSP. NOV.

SCIUROPTERUS MINDANENSIS SP. NOV., A NEW SPECIES OF FLYING SQUIRREL FROM MINDANAO

By DIOSCORO S. RABOR

Of the Division of Fisheries, Department of Agriculture and Commerce Manila

FOUR PLATES

In August, 1937, Francisco S. Rivera and the writer collected eight specimens of a flying squirrel in the neighborhood of Badiangon, a small coastal barrio of Gingoog, Oriental Misamis Province, on the northern coast of Mindanao. As far as the writer can determine, this is the first record of the flying squirrel in the mainland of Mindanao, although R. C. McGregor and A. Celestino, in January, 1907, collected the only known specimen of *Sciuropterus crinitus* Hollister, now in the United States National Museum, in Basilan Island, off the southern tip of Zamboanga Peninsula. There has been no record of recapture of this species in Basilan Island, so that the present form from the mainland of Mindanao cannot be actually compared with the Basilan form, except through the written description. The present species was compared with Palawan forms, and found to differ very markedly from the latter.

It is strange that this animal is known only to the people who are residing in or very near the place of collection, as *kao-kag*, and totally unknown in the nearby towns. The rather bushy tail is utilized by the natives as a duster.

The species is nocturnal, spending the daytime in holes in tree trunks. One such abode was pointed out to us by a native who was very familiar with the habits of this animal.

The animal was collected in the evening, when individuals emerged from their hollows and descended to the shore regions to feed on the developing fruits of the coconut (*Cocos nucifera* Linn.), santol [*Sandoricum koetjape* (Burm. f.) Merr.], and durian (*Durio zibethinus* Murr.). Even from a distance one could easily detect the presence of the animal in a particular tree by its peculiar loud whistling-hissing note, although locating it definitely among the branches was another problem.

The writer proposes the name *Sciuropterus mindanensis* for this new form after the name of the island where it was discovered.

The writer is greatly indebted to Dr. Gerrit S. Miller Jr., Curator of the Division of Mammals, United States National Museum, for going over this manuscript and making comparisons of a paratype of the present species with the type specimen of *Sciuropterus crinitus* Hollister.

SCIUROPTERUS MINDANENSIS sp. nov.

Described from Nos. 223, cotype male, and 224, cotype female, Bureau of Science Collection, collected at Badiangon, Gingoog, Oriental Misamis Province, northern coast of Mindanao, August 1, 1937 (*D. S. Rabor and F. S. Rivera*).

Adult male.—Externally somewhat resembling *Sciuropterus crinitus* Hollister, but very much larger and darker; ears very small, inner surface for the most part naked, except for a few fine hairs; outer surface naked distally, well furred on basal third; three prominent long tufts of hair projecting from ear conch, one from below and one from each side, anterior tuft tending to fuse imperceptibly with that below; a prominent, roughly crescent-shaped blackish collar extending from behind ears to back of neck; vibrissæ coarse, elongate, reaching easily beyond ears, longest hair 60 millimeters; fur on forehead short, 12 to 14 millimeters, longest 17; on neck, 12 to 16 millimeters, longest 18; on back, 25 to 35 millimeters, on patagium of similar length as those of back and sides, but thinner and nicely arranged in definite longitudinal rows with alternate rows of naked skin between; edge of wing membrane with a fringe of very fine dense hair, 8 to 10 millimeters in middle span, 15 millimeters near attachment to foot, in color contrasting sharply with other portions of membrane; on ankle fur shorter than on legs; tail somewhat flattened, hair 42 to 45 millimeters near base, 32 to 35 millimeters near distal portion, 45 to 48 millimeters at tip; belly thin-haired, longest hair rarely exceeding 22 millimeters; outer longer hair straight, shorter underfur woolly on back.

Ears brownish at tips; upper and lower lips blackish brown; cheek buffy brown; postauricular regions pure buff; throat buffy. Body grizzled chestnut-auburn above, many hairs tipped with blackish, especially along middle of back, becoming fewer at sides; underfur slate to slate-gray at base, lighter at tips; head, especially forehead and crown, similar to back, with sides of

face and neck buffy brown, many hairs black or brownish black at tips, bases slate-gray; hairs in crescent-shaped blackish collar, long, slate-black at tips and slate-gray at bases, with underfur same as in surrounding regions; patagium, hairs above slate-black to blackish slate at base and pale chestnut at tips; hair at edge of membrane slate-black at base and brownish buff at tips; hair on underparts of body and limbs for the most part buffy, underfur gray; hair on scrotum pure chestnut to amber-brown, forming a distinct splotch of color on buffy underside of body; tail at base, above, and at sides brownish, some hairs tipped with black but with gray bases like others; first proximal fourth of tail, like base, a little darkened distally by increase in black portion of some hairs and by increase in number of black-tipped hairs, with basal color changing to brownish gray; distal three-fourths much darker than proximal portion, blackish color becoming more intense as it progresses distally, almost solid black at tip; tail at base, below, brownish buff, extreme tips of hairs blackish, basal color grayish; buffish color continuing on underside of tail for nearly its whole proximal fifth and along narrow median line; most distal fifth of tail uniformly blackish, like sides and back; ear tufts buff at bases, blackish at tips; vibrissæ elongate, black.

Adult female.—Externally similar to male, with corresponding splotch of pure chestnut to amber-brown around external genitalia and anal region.

SKULL AND TEETH (FROM SKULL AND TEETH OF COTYPE MALE)

Skull resembling that of other Philippine members of the genus *Sciuropterus*, but much larger.

Upper incisors elongate; combined width at tip, 5 millimeters; length of exposed portion, 9.5; total length of an extracted tooth following curve, 31. First upper premolar very small, inserted at a strong angle, root extending backward against that of second premolar. Second premolar large, molariform, enamel folded and ridged, forming three prominent outer cusps; enamel on sides of ridges rather beaded and pitted; on first and second molars the folds extending across teeth only halfway or a little more; both molars with two prominent outer cusps; inner surface rather depressed. Third molar with one prominent outer cusp. First premolar with only one root; second premolar with three roots; first molar with three roots; second molar with four

roots; third molar with three roots; in each of the large cheek teeth inside root stoutest, outside roots slender except those of last molar in which both inside and posterior outside roots are stout; last two molars with crowns tending to turn outward.

Lower incisors elongate; combined width at tip, 5 millimeters; length of exposed portion, 16; total length of an extracted tooth following curve, 34. First lower premolar about three-fourths as large as first molar, enamel folded, anterior fold running completely across tooth, leaving two prominent cusps and a small accessory cusp between them on outer edge; each molar with a small accessory cusp between the two prominent cusps on outer edge; inner surface depressed; all lower cheek teeth with two not strongly-defined cusps on inner edge (anterior cusp more developed) and a minute intermediate cusp; first premolar with two roots, the posterior very stout, clearly suggesting fusion of two original roots; each molar with four well-defined roots (a very tiny fifth root was found between the posterior root pair of the first molar on left side), with posterior outer root of each molar stoutest.

Measurements of the cotypes of Sciuropterus mindanensis sp. nov.

	No. 223, male. mm.	No. 224, female. mm.
Total length	810	790
Tail	440	460
Hind foot	70	70
Ear from meatus, vertical	20	20
Length of ear tufts	36	36
Skull:		
Upper length	72	71.5
Basal length	68	67
Zygomatic breadth	43	41.1
Nasals, length	22	22
Nasals, greatest breadth	10	9.5
Frontal length	27.5	27.5
Interorbital breadth	17.7	18
Postorbital breadth	12	12
Vertical diameter of orbit	15.2	15
Breadth between tips of postorbital processes	28	28
Palate	32	32
Diastema, upper	15.4	15.2
Diastema, lower	9	9.5
Length of upper tooth series	14.5	14.8
Length of four large teeth	13.6	13.4
Length of mandible to condyle	44.1	43.8
Length from incisor tip to condyle	50	48.5
Lower tooth row	15.2	14

The intensity of the coloration on the back varies with age, the younger specimens being not as intensely colored as the older. Likewise, the crescent-shaped blackish collar varies in extent and depth of coloration with age, being larger in extent and deeper in intensity in older animals, and almost absent in young specimens. In one specimen (male, B. S. No. 226) the chestnut coloration of the scrotal region extends all over the anal area and the underside of the hind limbs, becoming a bit paler in these parts.

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ILLUSTRATIONS

PLATE 1

Sciuropterus mindanensis sp. nov.; male cotype, B. S. No. 223.

PLATE 2

Sciuropterus mindanensis sp. nov.; female cotype, B. S. No. 224.

PLATE 3. SCIUROPTERUS MINDANENSIS SP. NOV.

FIG. 1. Male cotype, skull, dorsal view; × 1.
2. Male cotype, skull, ventral view; × 1.
3. Male cotype, lower jaw, superior view; × 1.
4. Male cotype, lower jaw, lateral view; × 1.

PLATE 4. SCIUROPTERUS MINDANENSIS SP. NOV.

FIG. 1. Female cotype, skull, dorsal view; × 1.
2. Female cotype, skull, ventral view; × 1.
3. Female cotype, lower jaw, superior view; × 1.
4. Female cotype, lower jaw, lateral view; × 1.

PLATE 1. SCIUROPTERUS MINDANENSIS SP. NOV.

PLATE 2. SCIUROPTERUS MINDANENSIS SP. NOV.

PLATE 3. SCIUROPTERUS MINDANENSIS SP. NOV.

PLATE 4. SCIUROPTERUS MINDANENSIS SP. NOV.

THE PUKOT FISHERIES OF LAGUNA DE BAY

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TWO PLATES AND FIVE TEXT FIGURES

In August, 1938, the writers had occasion to check certain observations and data relative to the pukot fisheries of Laguna de Bay; the greater part of the present report has been based upon the results of this study. Additional data on the pukot have also been gathered. Among the things discussed in this report are: (*a*) the pukot and its operation; (*b*) the pukot in relation to the kanduli fisheries; and (*c*) suggestions for additional measures to increase the effectiveness of Fish and Game Administrative Order No. 3 for the conservation and rehabilitation of the kanduli fisheries of Laguna de Bay.

For the gathering of data a questionnaire in tabulated form was used, into which was entered the information gathered from fishermen, together with actual measurements made of pukot nets. The information called for in the questionnaire included: (*a*) kind of pukot; (*b*) name and residence of the pukot owner; (*c*) number of pieces (*banatan*) of the different sections of the net; length, width, kind of netting, size of ropes, and number of floats of each banatan; (*e*) depth of water in the lake where pukot may be operated; (*f*) number of fishermen necessary to operate the pukot; and (*g*) cost of the pukot outfit. This information, together with other data gathered, was placed in separate tables, charts, and graphs.

The pukot is apparently the most important and most effective fishing gear in Laguna de Bay. It catches all the fish in the area it encloses except the very small ones that can pass through the meshes of its *tarupit*. Records of catches compiled show that a large pukot (*pukot laot*) is capable of catching in a single haul, fish, mostly kanduli, worth 1,000 pesos. Yet the average pukot catch, in recent years, has hardly been paying operation costs.

There are about 150 pukot in Laguna de Bay, valued at 95,000 pesos. To this amount may be added the cost of about 20 motor

boats used in towing the pukot to the fishing ground. Approximately 3,000 fishermen are directly engaged in the operation of pukot. Besides, some 1,000 persons acting as middlemen (*regatón*) depend on pukot for their trade, going to the pukot by sailboats to buy the catches which they sell in turn to fish vendors on land (Plate 2, fig. 3).

THE PUKOT AND ITS OPERATION

PUKOT LAOT

Description.—A pukot-laot outfit consists of two large bancas (each about 15 meters long, 1.5 meters wide, and 1 meter deep); three smaller bancas (each about 9 meters long, 1 meter wide, and 0.5 meter deep); and the pukot net.

One of the two large bancas, called *lambatan,* is used to hold the net, and into the other, the *dalagan,* the fishermen pull the net. Each is provided with an outrigger on only one side (usually the right) so that they can come close to each other during actual fishing operations. One of the small bancas, also with an outrigger, is used by the fishermen in driving bamboo poles into the bottom of the lake to which the bag of the net is tied. This banca is called the *buralan* or *pangipitan.* The two remaining small bancas, *alagaan,* are used by the divers for rest and to hold on to in the water.

The pukot is divided into sections composed of pieces of nettings called *banatan.* These sections are: (1) *tarupit;* (2) *panaklob;* (3) *pangkulong;* (4) *panglundo;* and (5) *pamaspas.* The netting of pukot is of the Aguinaldo standard.

The tarupit is of a single banatan of No. 23 or No. 6 cotton netting, somewhat rectangular in shape, about 10 meters long and 11 to 13 meters wide or deep. The bottom or sinker line is a double rope, while the float line is single. Both lines are of abacá rope 3.5 and 3 centimeters in circumference, respectively. The net is selvaged to the ropes with 5 to 10 meshes of No. 5 or No. 10 thread; the mesh stretched measures 3.5 centimeters. To the float line are attached 40 to 50 wooden floats, each about 10 centimeters long and 5 centimeters in diameter at the middle, and placed at intervals of about 20 centimeters. The free end of this section is selvaged to a double cotton rope to which are attached cotton rope rings at intervals of about 0.5 meter. By hauling in the bottom line this banatan is converted into a large dip net.

The panaklob is also of a single banatan. It is a rectangular net, twice as long as the tarupit but a little narrower. As the name suggests, it is used to cover the opening of the dip of the tarupit, thus enclosing the fish that may be contained in the net. The nettings, selvages, and sizes of the ropes are the same as those of the tarupit.

The pangkulong is composed of three banatan, each 50 to 65 meters (2,500 to 3,000 meshes) long and from 6 to 10 meters wide or deep. The netting is either of No. 6 or No. 14. The selvages and ropes used are the same as those of the tarupit and panaklob. To the float line are attached 100 to 150 floats at intervals of about 20 centimeters. This section is the portion of the pukot where the fish are concentrated before reaching the pocket or tarupit.

The panglundo consists of 22 to 30 banatan and each piece is made in the same manner as the pangkulong. In some pukot the different pieces of this section are made gradually narrower. The nettings have wider meshes of Nos. 18, 19, 24, or 31. This section is the one that drives the fish to the pangkulong.

The pamaspas consists of two to five pieces of nettings of larger meshes (No. 24 or No. 23) than that of the panglundo. The different pieces are also made gradually narrower. This section, the wing, is the first to be pulled in the process of hauling in the net.

Operation.—At the commencement of the fishing season or after each treatment of the net the different banatan are joined end to end. The different sections are in the following order: tarupit, panaklob, pangkulong, panglundo, and pamaspas.

A day before fishing the net is loaded in the lambatan in the reverse order so that the pamaspas is at the bottom and the tarupit at the top. Very early the following morning the pukot is taken to the fishing ground. Motor boats are used to tow the pukot outfit. Some pukot outfits, however, go to the fishing ground by rowing or sailing. Usually some men are sent ahead in a small banca to scout for schools of fish. When a school of fish is located, a flag is hoisted for the rest of the pukot outfit to follow.

On reaching the area to be fished, the men in the lambatan pay out the net in a circular form leaving a small opening of about 100 meters between the two ends. To each end is attached a brail where a big long rope is tied. The two big bancas take their positions about 100 meters from the ends of the net (text

fig. 1) and each anchors by means of a bamboo pole as *pamondo* or *barahan* driven to the bottom of the lake. Then the fishermen in both bancas begin to pull the ropes attached to the brail at each end of the net. The men on the dalagan pull the end of the tarupit and those on the lambatan pull the end of the

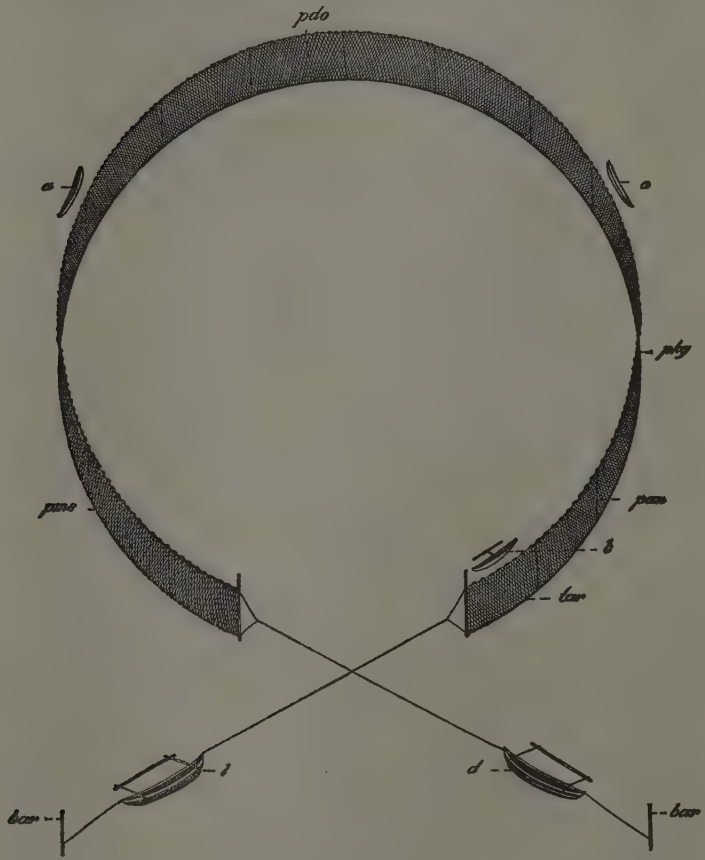

FIG. 1. Initial position of pukot laot.

pamaspas. This operation is continued until the two ends come within about 5 meters of each other.

Meanwhile the men on the alagaan go around the net and inspect the bottom line to see that it is in contact with the bottom of the lake to prevent fish from passing through.

The men on the buralan then drive bamboo poles (*bural*), one very near the free end of the tarupit and another at the joint of the tarupit and panaklob. To these bamboo poles, the *pirmihan* and *parungo*, respectively, are tied the ends of the tarupit. Two other poles, the *alalay*, are placed near the pirmihan, which are used as supports. One of them is placed about 5 meters away, in line with the tarupit, and is moved closer and closer to the pirmihan as the net comes closer to this bural. The other is placed about 5 meters within the enclosure at right angles to the pirmihan and parungo. To these alalay are tied ropes connecting the pirmihan. The free end of the tarupit is ringed to another pole, the *tuhog*, by its rope rings. The tuhog

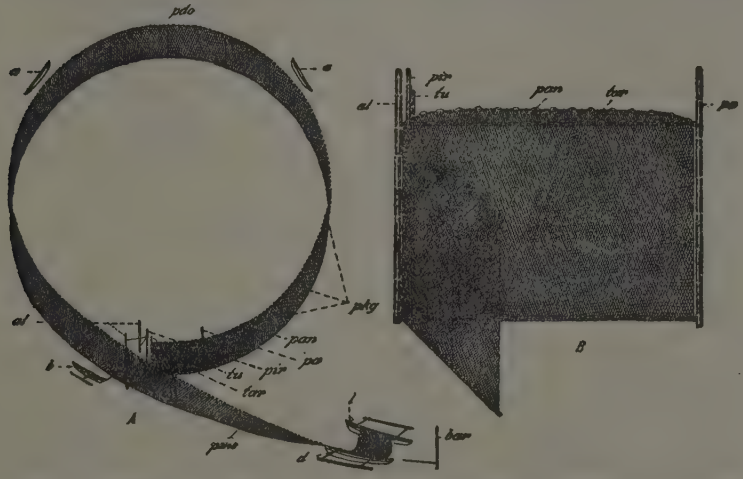

FIG. 2. *A*, Hauling in of pukot laot: *B*, position of the tarupit and panaklob in the final concentration of the fish.

is then tied to the pirmihan. Small ropes (*hugos* or *pamuntot*), about 6 meters long and placed at intervals of about 1 meter, are tied to the bottom line of the tarupit. The hugos is bent into several short loops of about 30 centimeters, bound together by the loose end and buried in mud within the enclosure (Plate 2, fig. 1; text fig. 2, *A*).

While the bural are being placed, the dalagan moves to a new position, coming close to the lambatan. After anchoring, the men continue to pull in the pamaspas by means of the rope and the sinker and float lines are then held together with the netting rolled around them. Pulling is continued with the help of some

men transferred from the lambatan to the dalagan, while the others remain behind to load the pulled portion of the pukot into the lambatan. Pulling and loading of the net is continued, gradually reducing the size of the enclosure. The divers, *magaalaga*, continually inspect the bottom line of the net, especially the moving portion, seeing to it that it is not raised during this operation and that it drags very smoothly on the bottom. The men at the tarupit beat the water and create noise to drive the fish to the farther portion of the enclosure. They also help in the inspection of the bottom line of the net near the pirmihan.

When about two-thirds of the net has been pulled and loaded and the moving portion has come very close to the pirmihan, the dalagan and lambatan transfer to a new position in alignment with the net. This operation, called *paling*, reduces the strain in pulling and avoids damaging and wearing the net by friction against the pirmihan. The alalay in the enclosure of the net is now removed, and pulling and loading of the net is resumed until the panaklob has closed the opening of the dip of the tarupit. The magaalaga then signal the men on the dalagan to stop pulling the net. Then the bottom line of the panaklob is pulled alone until it comes close to that of the tarupit (text fig. 2, *B*).

As soon as this is accomplished, the dalagan is rowed to the tarupit and tied with the outriggerless side toward the pirmihan and parungo and the men start to pull the hugos or pamuntot that have been brought out of the water by the magaalaga, while the men in the lambatan continue to load the pangkulong of the pukot. The sinker line is lifted and the pamuntot is pulled; the tarupit is thereby converted into a bag containing the catch. The panaklob is then detached and the tuhog pulled out of the water. The tarupit is untied from the parungo and pirmihan and the sides together with the nettings near the sinker line are lifted and the catch concentrated. The fish is brailed out by means of a small dip net (*salok*) that also serves as a measure in selling fish to the middlemen.

Pukot laot is the largest of the drag seines used in Laguna de Bay. The word *laot* means that this pukot is operated on the deeper and farther portions of the lake. The bulk of the catch is kanduli (*Arius* spp.) although *biya* [*Glossogobius giurus* (Buchanan-Hamilton)] is also caught in appreciable quantities together with a few other species of fish found in the lake. With the depletion of kanduli, to be discussed later, biya has increased

in proportion in the catch of the pukot. This tendency has been shown also in the baklad. (Villadolid, 1934.)

OTHER KINDS OF PUKOT

Pukot alañgan.—This pukot resembles very closely the pukot laot and is operated in much the same way, but it is shorter and narrower than the latter. This pukot has 19 to 25 banatan (approximately 1,000 to 1,500 meters) with a depth [1] ranging from 5 to 7.5 meters. It is operated in the lake when and where the water is about 3 to 4 meters deep, and the same species of fish taken by the pukot laot are caught.

Pukot barimbao.—The *pukot barimbao* consists of 9 to 18 banatan and is about 500 to 900 meters long, with a depth of 4 to 6 meters. Only one large banca, which serves as dalagan and lambatan, is used, as in the operation of this pukot the net is left in water until after the catch has been brailed out. It is operated in the same manner as the pukot alañgan or the pukot laot. This pukot catches the same species as the other two pukot described above, but more dalag (*Ophicephalus striatus* Bloch) are included.

Pukot dalag.—The *pukot dalag* is the smallest of the drag seines used in Laguna de Bay, and is operated in shallow waters, just beyond the vegetative zone. Aldaba (1931) gives a short description of this pukot. The net is made of 6 to 8 banatan and is about 300 to 500 meters long and 3 to 4.5 meters deep. Only one banca, 8 to 10 meters long, about 1 meter wide, and 1 meter deep, and provided with an outrigger, is used in the operation of this pukot. The operation resembles closely that of the barimbao, except that the tarupit is held high above water with stakes to prevent the dalag from jumping out. This pukot is primarily used to catch dalag but may also take a small number of other species.

THE PUKOT IN RELATION TO THE KANDULI FISHERIES OF LAGUNA DE BAY

THE NUMBER OF PUKOT AND FISHING AREAS IN THE LAKE

The pukot is operated in practically every portion of Laguna de Bay except the marshy, sandy, and stony places, which present obstructions or are too shallow to permit the successful operation of the pukot. Pukot fishermen also find difficulty in places oc-

[1] It is customary to take the width of the pangkulong as the depth of the pukot measured with the meshes of the nettings stretched.

cupied by *baklad* (fish corrals) and *bobó* (bamboo fish traps). They often have trouble with the owners of these traps and run the risk of tearing their nets on submerged poles.

The area of Laguna de Bay is about 93,000 hectares. Deducting from this area about 15,000 [2] hectares of marshy, sandy, and stony places where pukot cannot operate, 77,000 hectares are open for pukot fishing. The total length of 99,948 meters (Table 1) of the 150 pukot nets used in the entire lake will enclose a circular area of 79,482 hectares. This area is greater by 2,412 hectares than the area of the lake available for pukot fishing, and is only a little smaller than the total area of Laguna de Bay.

TABLE 1.—*Kind, number, and length of pukot, by municipalities in Laguna de Bay.*

Municipality.	Pukot laot.		Pukot alañgan.		Pukot barimbao.		Pukot dalag.		Total.	
	Number.	Length.	Number.	Length.	Number.	Length.	Number.	Length.	Number.	Length.
		m.		m.		m.		m.		m.
LAGUNA										
Calamba							8	1,824	8	1,824
Los Baños	2	2,940					2	530	4	3,470
Pila	3	5,545					10	2,650	13	8,195
Paete			3	3,780					3	3,780
Pakil			3	3,954					3	3,954
RIZAL										
Tanay	4	6,320			1	982			5	7,302
Morong							48	13,056	48	13,056
Cardona	2	3,008			3	3,032			5	6,040
Binañgonan	5	8,082			7	3,920	1	330	13	12,332
Angono	10	15,005	2	2,212	11	6,500			13	23,717
Tagig					7	4,790	5	1,790	12	6,580
Muntinlupa	1	1,623	3	3,032	9	5,043			13	9,698
Total	27	42,523	11	12,978	38	24,267	74	20,180	150	99,948

Of course, in actual fishing the area available to pukot fishing is not entirely covered by all pukot in a day. Each operates singly and encloses a small portion of the lake. An average-sized pukot of 25 banatan (2,000 meters) in Laguna de Bay will enclose about 18 hectares. One hundred and fifty pukot of this size will fish out 2,700 hectares a day and may cover the entire area available to pukot fishing in about a month. However, not all pukot operate at the same time in any single

[2] The area of these places has been calculated by means of a planimeter.

day, and fishing with small pukot is limited to certain depths of water. Were it not for the fact that fish constantly move, the lake would be exhausted of fish within a month. In any case, it is obvious that one hundred and fifty pukot are too many for a lake as small as Laguna de Bay, and that pukot alone is enough to overfish and deplete the kanduli fisheries of Laguna de Bay even if eggs and immature and spawning fish are given full protection.

EFFECT OF PUKOT FISHING ON SPAWNING KANDULI

The usual pukot fishing season is during the dry months, January to July. During the last few years, however, some pukot operated throughout the year. Observations show that pukot catch most fish during April to June, the period when the water level of Laguna de Bay is at its lowest (text fig. 3), and when kanduli congregate in large schools to spawn (Mane, 1929).

The brooding male kanduli captured eject the eggs they incubate in their mouths, which drop to the bottom of the lake to rot, as they cannot develop further. Heaps of eggs are not infrequently found under the tarupit of the pukot after the catch has been brailed out during the spawning season of the kanduli. Some of these eggs are gathered by fishermen and sold on land. As many as 5 to 10 kerosene cans of eggs are landed by a single pukot in a day. The fingerlings that are able to hatch from the eggs, especially at the end of the spawning season, are also caught by the pukot, as the meshes of the net are too small to allow the passage of small fishes. These are probably the reasons pukot is considered the fishing gear most destructive to the kanduli fisheries of Laguna de Bay.

SIZE COMPOSITION OF KANDULI CAUGHT BY PUKOT

In order to determine the present composition of kanduli caught by pukot, four samples were collected in four different portions of the lake in August. In taking the samples a small dip net was used to brail out the fish from the tarupit. A dipnetful of fish was used as a sample. The fish were measured from the tip of the snout to the end of the caudal vertebræ. Text fig. 4 shows the result.

Text fig. 4 shows that only the first and second-year-size groups are represented, and that the greater proportion, 75.47 per cent, of the fish in the samples collected are immature. The larger-sized kanduli, from 25 to 37 centimeters long, recorded

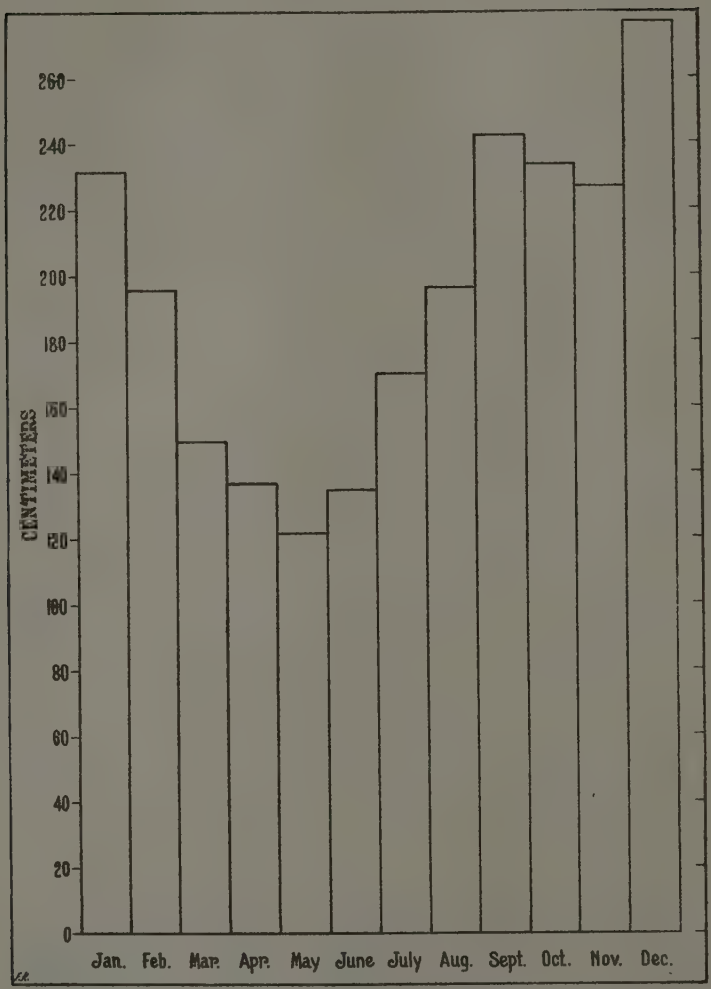

FIG. 3. Monthly average of the water level of Laguna de Bay from June, 1935 to August, 1938. (Data taken partly from the record of the gauge keeper of the Bureau of Public Works at Los Baños, Laguna, and partly from Cendaña and Mane, 1929.)

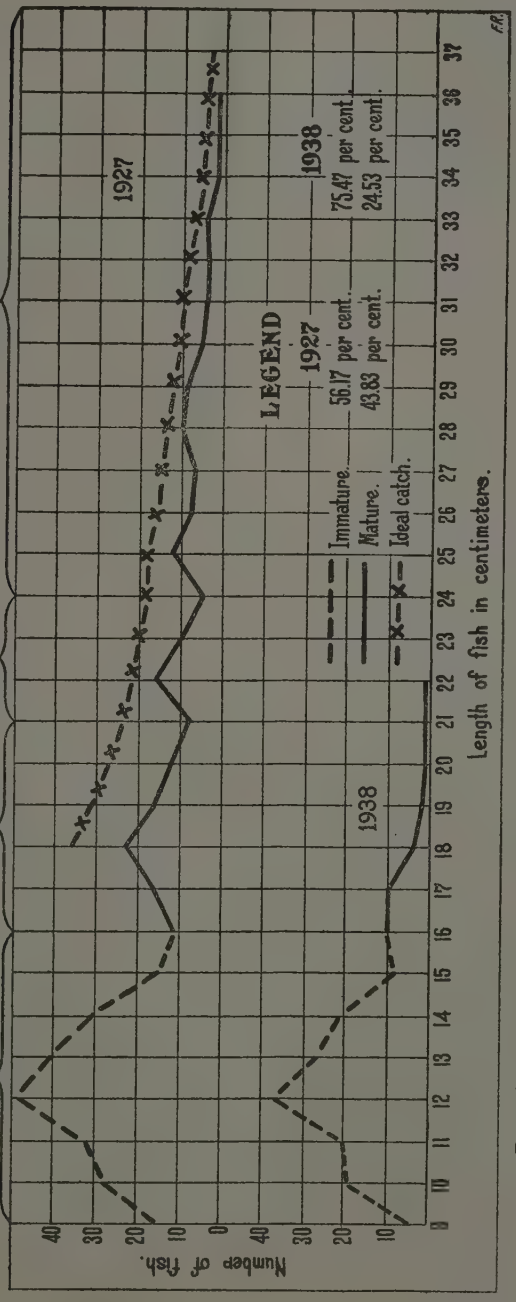

FIG. 4. Average length frequency of kanduli caught by pukot, from samples taken in September, 1927, and August, 1938.

in 1927 (Mane, 1929), were absent in the present catch of pukot. Moreover, the fish in the second-year-size group are very few and fail to form a distinct mode, indicating that the quantity in the lake is very small. This group is now the only source of the first-year-size group, showing clearly that depletion of kanduli in Laguna de Bay is very acute and that it has reached a point when the fish can hardly reach maturity.

The scarcity of kanduli in Laguna de Bay is further evidenced by the fact that the present catch of pukot is relatively very small. Observations made about ten years ago showed that an average catch of pukot laot was from 50 to 100 *kaengs*[3] in a single operation. On this trip no pukot was seen to catch more than 10 kaengs of kanduli.

An effective program of conservation and rigid enforcement of regulations is needed to conserve and rehabilitate the kanduli fishery in Laguna de Bay. By such regulations the aim should be to reach the level of abundance of the fish in the lake, so that an ideal economic catch would consist of mature fish with practically all the mature-size groups represented, as indicated by a theoretical smooth curve in text fig. 4. This ideal catch could be attained more or less by properly protecting the immature fish and breeders and providing fish refuges.

REGULATIONS ON THE USE OF THE PUKOT

The existing regulations on the use of pukot are embodied in the Fish and Game Administrative Order No. 3, which reads as follows:

> It shall be unlawful during the closed season period for any person, association or corporation to use "seket" and "pukot", "pukot laot" or "pukot alañgan" in Laguna de Bay from April 16 to July 15 of each year.

The closed season is directed toward the conservation of the kanduli by protecting the spawning fish and eggs. It has been shown that the kanduli can easily be depleted by pukot even if the eggs and immature and spawning fish are given full protection, and that a large proportion of the pukot catch consists of immature fish. It is, therefore, evident that the present regulations restricting the uses of pukot are still inadequate for the conservation of kanduli in Laguna de Bay, and it is suggested that Fish and Game Administrative Order No. 3 be amended by providing reserved areas that should not be entered by the

[3] Bamboo basket of about 30 kilograms capacity.

pukot and other gear, standardizing the mesh of the tarupit to allow the passage of immature fish, and limiting the length and depth of the pukot. By this limitation the deeper portions of the lake would also serve as partial refuges. Text fig. 5 shows the contour of the different depths of water in Laguna de Bay during the annual low lake level; contour lines are based on soundings taken at intervals of 2 feet or 60 centimeters. The area of each depth is calculated on the map by means of a planimeter, and given in Table 2.

TABLE 2.—*Area of different depths of Laguna de Bay at annual low lake level.*

Minimum depth.	Area contained in each elevation.	Cumulative total.
Ft.	*Ha.*	*Ha.*
17	235	235
15–17	4,660	4,895
13–15	13,551	18,446
11–13	16,836	35,282
9–11	19,628	54,910
7–9	5,978	60,888
0–7	32,182	93,070
Total area of the lake	93,070	93,070

If the width or depth of the pukot is limited to 5.5 meters or about 18 feet (measurement of the pangkulong with meshes stretched) it will actually have a depth of 4.7 meters or about 15 feet, due to the widening of the meshes. This depth will be further reduced by 1 foot because of the current and pulling forces, so that in actual operation the net would be 4.4 meters or 14 feet wide or deep. This depth of the net cannot be operated in water deeper than 15 feet; thus the area of the lake that will ultimately be untouched by the pukot will be about 5,000 hectares, during the minimum water level of the lake in May. This area will be increased with the rise of the water level of the lake during the rainy season. The maximum height of water of Laguna de Bay from June, 1935, to August, 1938, was 3.10 meters above sea level, and the average minimum level was 1.21 meters, or a difference of 1.89 meters (about 6 feet). A rise of 60 centimeters (2 feet) will reserve areas deeper than 13 feet, or 18,446 hectares; of 120 centimeters (4 feet), areas beyond 11 feet deep or 35,282 hectares; of 180 centimeters (6 feet), areas deeper than 9 feet or 54,910 hectares (text fig. 5).

FIG. 5. Map of Laguna de Bay showing the countour of depths of water at 2 feet (about 60 centimeters) intervals at annual low lake level.

The number of pukot in Laguna de Bay is classified according to depth of the pangkulong as follows:

Depth of pangkulong. m.	Number of pukot.
4.0	92
4.5	13
5.0	2
5.5	9
6.0	12
6.5	2
7.0	0
7.5	3
8.0	19
Total	150

Thirty-six pukot will be affected when the maximum depth of 5.5 meters is applied. These, mostly the pukot laot and pukot alañgan, may continue to fish, however, if reduced in depth.

The netting commonly used for the tarupit is No. 6. When the net is new, the meshes stretched measure 3.5 centimeters. However, after several treatments with tanning extract and cow's blood, the meshes decrease in size by about 0.5 centimeter. This size does not allow immature fishes to pass through. It is recommended that nettings of not less than 4 centimeters mesh stretched after treatment be used for the tarupit. It was found that a dip net with this size of meshes used to brail the catch allows a great proportion of young kanduli to pass through. The few immature fish that remain are from 14 to 16 centimeters long, almost the size attained by kanduli at sexual maturity.

SUMMARY

1. The present paper is a report on the pukot fisheries of Laguna de Bay, dealing with the description and operation of pukot; pukot in relation to kanduli fisheries; and regulations on pukot.

2. Pukot is the most important and most effective fishing gear in Laguna de Bay. There are 150 of these nets, valued at about 95,000 pesos, with about 3,000 fishermen directly engaged in their operation. There are about 1,000 middlemen who buy the catch of pukot to be sold on land.

3. The description and operation of *pukot laot* are given. Four kinds of pukot are used in Laguna de Bay; namely, pukot laot, pukot alañgan, pukot barimbao, and pukot dalag.

4. The depletion of the fisheries of Laguna de Bay is aggravated by overfishing, with pukot too numerous for such a small lake. These nets, if joined end to end, will enclose an area little smaller than that of the lake and more than that available for pukot fishing. An average-sized pukot will enclose 18 hectares, and the 150 pukot can fish out 2,700 hectares of the lake in a day, operating singly. The total area available to pukot fishing can be covered by the 150 pukot in about a month.

5. An enormous quantity of fish eggs are destroyed, and immature fish are caught in great quantities with the fine-meshed nets, because the fishing season for pukot coincides with the spawning season of kanduli.

6. The depletion of kanduli in Laguna de Bay is very acute. The point has been reached when fish hardly reach maturity.

7. The provisions of Fish and Game Administrative Order No. 3 are not adequate for the conservation and rehabilitation

of the kanduli fisheries of Laguna de Bay. It is suggested that certain areas be reserved and the mesh openings of the tarupit of pukot standardized.

It is recommended that section 3(b) of the Fish and Game Administrative Order No. 3 be amended to read as follows:

(*b*) It shall be unlawful for any person, association, or corporation:

(1) To use any kind of pukot of more than 1,800 meters (30 banatan of 3,000 meshes, of 60 meters each) and pangkulong more than 5.5 meters deep (with mesh stretched) and tarupit with mesh stretched less than 4 centimeters.

(2) To fish with any kind of pukot longer than 500 meters (8 banatan of 3,000 meshes each) and with pangkulong 4.5 meters deep and tarupit with meshes stretched less than 4 centimeters, during the close season period from April 16 to July 15, inclusive, of each year.

(3) To fish with any kind of pukot, seket, and other fishing gear in any area reserved or that may later be reserved as fishery refuge and sanctuary in Laguna de Bay.

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ILLUSTRATIONS

PLATE 1

FIG. 1. Lambatan with nets sheltered inside.
2. Fishermen mending pukot nets.
3. Fishermen spreading net for drying on a grassy field after treatment with preservative.

PLATE 2

FIG. 1. Pulling and loading net during operation of pukot.
2. Treating nets with cow's blood.
3. Brailing the catch to be sold to middlemen.

TEXT FIGURES

[Abbreviations: *a*, Alagaan; *b*, buralan or pangipitan; *d*, dalagan; *l*, lambatan; *ta*, tarupit; *pan*, panaklob; *pkg*, pangkulong; *pdo*, panglundo; *pms*, pamaspas; *bar*, barahan or pamondo; *al*, alalay; *pir*, pirmihan; *tu*, tuhog; *pa*, parungo.]

FIG. 1. Initial position of pukot laot.
2. *A*, Hauling in of pukot laot; *B*, position of the tarupit and panaklob in the final concentration of the fish.
3. Monthly average of the water level of Laguna de Bay from June, 1935, to August, 1938. (Data taken partly from the record of the gauge keeper of the Bureau of Public Works at Los Baños, Laguna, and partly from Cendaña and Mane, 1929.)
4. Average length frequency of kanduli caught by pukot, from samples taken in September, 1927, and August, 1938.
5. Map of Laguna de Bay, showing the contour of depths of water at 2 feet (about 60 centimeters) intervals at annual low lake level.

PLATE 1.

1

2

3

PLATE 2.

XENOJULIS, A NEW GENUS OF LABROID FISHES

By L. F. DE BEAUFORT

Of Amsterdam, Holland

THREE TEXT FIGURES

Among the collection of labroid fishes from the Philippines kindly sent me for identification by the Bureau of Science, I find two specimens belonging to different species, but both members of the same genus, hitherto undescribed. The description of the new genus is given below, as well as the description of a new species under this genus.

Genus XENOJULIS novum

Oblong, compressed. Body covered with large scales, scales on thorax and before origin of dorsal not smaller than others. Head naked. Preopercle smooth. Jaws with single crowded row of rather robust, pointed teeth, increasing in size anteriorly, where they are canines; foremost pair of teeth in lower jaw fitting into space between foremost pair in upper jaw, which are stronger than the others and a little apart, to receive the lower pair. Upper jaw with posterior canine. Lower pharyngeals concave behind; about three irregular rows of small conical teeth on body, two rows of similar teeth on anterior expansion of bone. Posterior row on body of bone consisting of somewhat larger teeth, median tooth of this row much larger than others. Mouth small, scarcely protractile. Dorsal with 9 spines and 11 soft rays. Anal with 3 spines and 11 soft rays. Dorsal and anal without scaly sheath. Pectorals truncate or somewhat rounded. Ventrals pointed. Caudal rounded. Gill opening rather large. Lateral line continuous, with a sharp bend below soft dorsal. Tubes of perforated scales ramified.

Key to the species of Xenojulis.

1. Caudal with a black spot on middle of upper and lower rays. A black spot between posterior anal rays..... *X. margaritaceus.*
2. Dorsal and anal without these markings but with rows of light spots. *X. montillai.*

XENOJULIS MARGARITACEUS (Macleay.). Text figs. 1 and 2.

Platyglossus margaritaceus MACLEAY, Proc. Linn. Soc. New S. Wales 8 (1883) 27 (nec C. V.).

Halichœres macleayi JORDAN and SEALE, Bull. U. S. Bur. Fish. 25 1906 (1905) 303.
Halichœres macleayi FOWLER, Mem. B. P. Bishop Mus. 10 (1928) 342.

Dorsal, IX, 11; anal III, 11; pectoral 2, 11; ventral I, 5; lateral line, 28 or 29; 2 scales above, 7 to 8 scales below lateral line. Head subequal to height, 2.8 to 3.1 in length, 3.6 to 3.7 in length with caudal. Eye 5 in head, 1.5 in snout, about equal to convex interorbital space. Mouth small, corner before vertical through anterior nostril. Dorsal spines gradually increasing in size posteriorly, last one somewhat more than snout. Membranes between spines incised, four anterior spines sometimes with a short prolongation. Soft dorsal slightly higher than spinous part. Soft anal similar to soft dorsal, both fins rounded behind. Color of preserved specimens yellowish, darker on top of head.

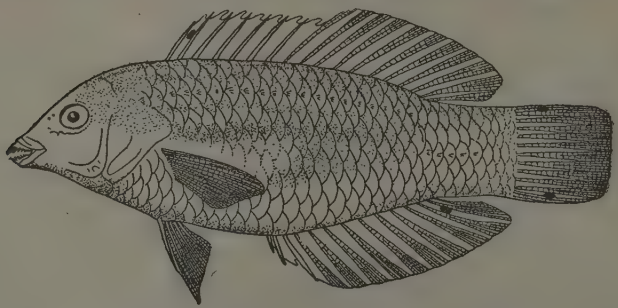

FIG. 1. *Xenojulis margaritaceus* (Macl.), type of *Platyglossus margaritaceus* Macl. After a sketch made by Mr. Gilbert Whitley. Natural size.

A more or less distinct, large, pearly area on middle of sides, more or less edged with black. Body with indications of broad transverse bands (male?) or with traces of dark longitudinal bands (female?). Traces of a pearly marking on operculum. Fins yellowish. A small black blotch between first and second dorsal spines, between ninth and tenth anal rays, and on middle of upper and lower caudal rays. Similar blotches may also be present (in male?) between second and third and between third and fourth dorsal spines, between first and second and between fifth and sixth anal, and a larger one between seventh and ninth dorsal rays. Two small spots may also be present (in the male?) on the ventral fin, one between first and second and one between second and third rays.

Two specimens known, one 95 mm long, from Hood Bay, New Guinea (*Platyglossus margaritaceus* Macleay) and one 74 mm

long, from Barrio Nalvo, Luna, La Union Province, Luzon, August 10, 1926, Bur. Sci. 14283, *Jose Montilla.*

This species was first described by Macleay. In this short description the number of dorsal spines is given as seven, and as I had a suspicion that my specimen from the Philippines might be of the same species as that of Macleay, I asked Mr. Gilbert Whitley to give me some information about the type specimen of Macleay. Mr. Whitley kindly gave me all the information I wanted, after he had got permission from Mr. N. Salter, curator of the Macleay Museum, Sydney, to examine the type. I thank these two gentlemen for their help in solving the identity of this remarkable species. Although the type has seven spines in the dorsal, as described by Macleay, I presume that this is an abnormality. Specimens of labroid species that have less than the normal number of spines have been

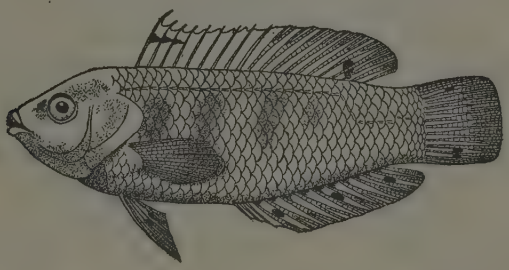

FIG. 2. *Xenojulis margaritaceus* (Macl.), Bur. Sci. 14283. Natural size.

recorded more than once. The specimen from Hood Bay and that from the Philippines are so much alike that it seems impossible that they belong to different species or different genera. Mr. Whitley kindly made a sketch of the type, which I reproduce here with a figure of the specimen from the Philippines. In this last specimen, a little smaller than the type, the number of blotches on the fins is greater than in the type, the first dorsal spines are somewhat produced, and there are traces of transverse bands on the body. This specimen may be a male and that from Hood Bay a female.

Before discussing the genus I will first describe a second species, which I propose to call *montillai,* in honor of the collector.

XENOJULIS MONTILLAI sp. nov. Text fig 3.

Dorsal IX, 11; anal III, 11; pectoral 2, 11; ventral I, 5; lateral line, 29; 2 scales above, 9 scales below lateral line. Height 2.9, in length, 3.5 with caudal. Head 3.2, in length, 3.9

with caudal. Height of head about 1.1 in its length. Eye 4.6, 1.6 in snout and 1.2 in convex interorbital space. Mouth small, corner before vertical through anterior nostril. Dorsal spines long and slender. Third spine longer than others, which are subequal in length; third spine about equal to snout and eye together. Soft dorsal higher than spinous part, pointed behind. Third anal spine longest, about as long as first dorsal spine. Pectorals as long as postorbital part of head. Ventrals pointed, first ray produced, longer than pectorals. Caudal rounded. Color of preserved specimen yellowish, upper part of head darker. Body with an indication of a longitudinal darker band and with traces of darker transverse blotches. Spinous dorsal white, with deep black blotches between first and second, second and third, third and fourth, and fourth and fifth spines. Soft

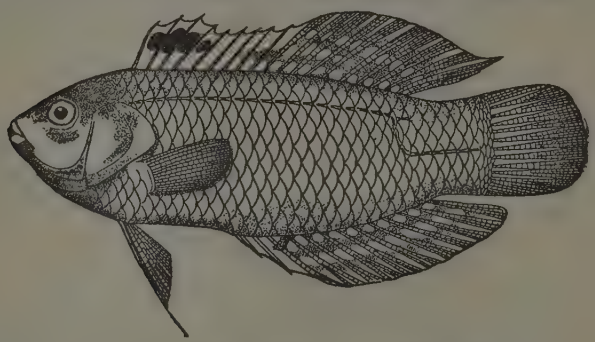

FIG. 8. *Xenojulis montillai* sp. nov. Natural size.

dorsal light brownish, with three irregular rows of white spots. Soft anal with similar rows of spots. Caudal white, upper and lower rays dusky.

A single specimen, 90 mm long, from Barrio Paraoir, Balawan, La Union Province, Luzon, December 16, 1925. Bur. Sci. 13050, *Jose Montilla.*

This species is very close to *X. margaritaceus*, from which it differs by its coloration and markings and by the different shape of the dorsal.

Xenojulis is related to *Halichœres* and to *Stethojulis*, perhaps more to the latter than to the former. It differs from *Halichœres* in having the scales of the thorax and those before the dorsal not smaller than those of the sides. In this respect it agrees with *Stethojulis*, where the thoracic scales generally are

even larger than those of the sides. *Xenojulis* differs, however, from *Stethojulis* in its dentition. The teeth in the jaws are pointed, not more or less incisiviform as in *Stethojulis*, and the anterior teeth are much larger than the posterior teeth, forming well-developed canines. In this respect *Xenojulis* again agrees with *Halichœres*, in which, however, the teeth are not so crowded as a rule. The lower pharyngeals, concave behind, are more like those of *Stethojulis* than those of *Halichœres*, but the difference is very slight and of no great importance.

As it is not quite sure that my specimen from the Philippines and that from New Guinea belong to the same species, although I have little doubt that the number of dorsal spines is abnormal in the latter specimen, I think it safer to select not the first described species but *Xenojulis montillai* as the type of the genus.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. *Xenojulis margaritaceus* (Macl.), type of *Platyglossus margaritaceus* Macl. After a sketch made by Mr. Gilbert Whitley. Natural size.

2. *Xenojulis margaritaceus* (Macl.) Bur. Sci. 14283. Natural size.

3. *Xenojulis montillai* sp. nov. Natural size.

NOTES ON SOME PHILIPPINE XYLOCOPA (HYMENOPTERA: XYLOCOPIDÆ)

By Tsing-chao Maa

Of Daw-Tsuen, Hangchow, China

The present paper is a report concerning *Xylocopa* material sent me for study and determination by Dr. A. Roman, of the Entomologiska Advelningen, Naturhistoriska Riksmuseum in Stockholm, and by Dr. W. Horn, Director of the Deutsches Entomologisches Institut, Berlin-Dahlem. In addition to records and taxonomical notes of previously described species and subspecies, the description of a new species and a check list of the known species of Philippine *Xylocopa* are also offered.

I am greatly indebted to Doctors Roman and Horn for loan of the material.

Genus XYLOCOPA Latreille (1802)

Subgenus BILUNA Maa (1938)

XYLOCOPA NASALIS MCGREGORI (Ckll.).

The present subspecies is scarcely separable from *X. nasalis iridipennis* (Lepel.) except in the following characters:

X. n. mcgregori Ckll.	*X. n. iridipennis* Lepel.
Genæ punctate.	Genæ impunctate.
Breadth of impunctate disc of mesonotum about one-fifth interspace between tegulæ.	Breadth of impunctate disc of mesonotum about one-third interspace between tegulæ.
Punctuation on median portion of abdominal tergite II relatively coarser, mostly in second-degree density.[1]	Punctuation on median portion of abdominal tergite II relatively finer, mostly in third-degree density.

The knee caps on the posterior tibiæ of *mcgregori* Ckll. are usually V-shaped, while those of *iridipennis* Lepel. are sometimes apically blunt or truncate. In some females of *iridipennis* Lepel. from the Sunda Island the outer orbital margins are grooved, but not in *mcgregori* Ckll.

Specimens examined.—"Philippine Is.," 1 female, Stockholm Museum; 3 females, author's collection.

[1] Terminology of Allen et Jaynes, Proc. U. S. Nat. Mus. (17) 76 (1930) 4.

Subgenus ORBITELLA Maa (1938)

XYLOCOPA PHILIPPINENSIS F. Sm.

Genæ impunctate, minimum length about thrice diameter of mandibular punctures. Upper portion of outer orbital margins with a deep narrow groove. Postgenæ and vertex strongly punctate in second-degree density. Coronal suture irrecognizable, represented by a narrow median impunctate band of vertex. Wing vein M longer than M_{1+2} (1st section); vein r-m S-curved, vein R_4 angulate at a point of basal two-thirds of its length. Posterior trochanters apically flattened and narrowly rounded. Inner teeth of anterior and posterior claws, respectively, about one-half and one-third as long as the corresponding outer teeth.

Specimens examined.—Mont Albon, one female, W. Schulthess, Deutsches Entomologisches Institut. (det. Maidl).

XYLOCOPA CHLORINA (Ckll.).

Female.—Originally described as a variety of *X. philippinensis*, from which it may be distinguished by the following characters: Wings basally with greenish coppery golden lustre, apically with rosy purplish tints. Occiput with few scattered yellow hairs. Scutellum entirely yellow-haired, with very scattered black hairs on median area of anterior portion. Frontal keel not broadened at its midway. Coronal suture basally distinct. Wing vein M subequal in length to M_{1+2} (1st section). Punctures on median portion of abdominal tergites III and IV comparatively sparser, with a more or less distinct median impunctate band.

Specimen examined.—Los Baños, one female, Baker, Deutsches Entomologisches Institut.

XYLOCOPA NEGLIGENDA sp. nov.

Male unknown.

Female.—Closely allied to *X. philippinensis* F. Sm.

Wings with faint rosy purplish lustre, apically with a slight greenish tint. Posterior half of scutellum yellow-haired. Postscutellum and thoracic pleurites entirely yellow-haired. Tegulæ black-haired. Extreme basal portion of wings and dorsal surface of anterior tibiæ covered with dominant yellow and scattered black hairs. Relative interorbital distance at the level of antennal fossæ to vertico-clypeal distance about 11: 14. Median fovea of frontal keel deep and broad. Epistomal suture moderately ridged. Width of median impunctate band of clypeus

about thrice diameter of clypeal punctures. Genæ twice as long as diameter of mandibular punctures. Postgenæ with very scattered coarse punctures of third-degree density, upper portion scarcely punctate. Vertex medially coarsely punctate in first-degree density, without median impunctate band, laterally (also interspaces between lateral ocelli and inner orbits) unevenly punctate in second-degree density. Length of interocellar distance to that of ocello-ocular distance about 9: 17. Length of antennal segment III to that of segments IV to VI as 8: 9. Segment IV longer than broad. Wing vein M about one and one-fourth as long as M_{1+2} (1st section).

Body, 30 millimeters; anterior wing, 24.

Holotype.—Tayanito Mai, one female, deposited in the Stockholm Museum.

In the distribution of the pubescence and in the density of the postgenal punctuation this new species is quite distinct from any member of the *X. philippinensis* group.[2] Superficially the present species and *X. ghilianii* Grib. are alike, but their wing color and breadth of thoracic collar are different.

XYLOCOPA GHILIANII Grib.

Female.—Redescribed here as follows:

Black, antennal segments IV to XII dark testaceous below. Wings fuscous, darkest at the cell Sc $+R_1 + R_2$, with beautiful greenish golden iridescence, basally with a slight bluish tint. Pubescence black, but on face, postgenæ, and dorsal surface of anterior tibiæ mixed with very few whitish hairs; pronotum, marginal areas of mesonotum, scutellum, thoracic pleurites, and extreme basal portion of wings with bright yellow hairs; postscutellum and anterior half of abdominal tergite I with dominant yellow and a few scattered black hairs; apex of abdomen with slightly ferruginous hairs. Length of interorbital distance at level of antennal fossæ to vertico-clypeal distance 9: 11. Inner orbits very weakly curved, distance between upper orbital extremities distinctly greater than that between lower. Face strongly punctate in first-degree density. Frontal keel weak, rather broad, roundly ended, its median fovea long, narrow. Supraclypeal region medially impunctate. Epistomal suture very weakly curved, not at all ridged. Clypeal sutures strongly curved. Tentorial pits small, oblong. Clypeus medially impunc-

[2] Cockerell (1930).

tate and moderately carinate. Labrum strongly tuberculate, with broad, shallow apical emargination. Genæ impunctate, minimum length about thrice diameter of mandibular punctures. Outer orbital margin with a deep and rather broad groove. Postgenæ with strong punctures of second-degree density, those on upper portion much sparser. Vertex strongly punctate in first-degree density, median band impunctate. Coronal suture irrecognizable. Interocellar distance to ocello-ocular distance 9:16. Basal side of ocellar triangle about 2.5 times that of either lateral side. Postocellar pits round, shallow. Interantennal distance about $\frac{2}{3}$ that of antenno-ocular distance. Antennal segment III about three-fourths as long as segments IV to VI; segments IV and V subequal. Dorsum of thorax strongly punctate in first-degree density, except disc of mesonotum and median band of scutellum which are impunctate; scutellar punctuation a little finer than mesonotal. Wing vein M about one and one-third as long as M_{1+2} (1st section); vein R_4 weakly curved at a point of basal two-thirds of its length. Knee caps on posterior tibiæ V-shaped, extending to basal three-sevenths of tibial length; apical two-thirds of upper margin distinct. Abdominal tergites strongly and evenly punctate in first-degree density, without distinct median impunctate band; median furrow of epipygium narrow. Posterior margin of abdominal sternites with weak median extension; hypopygium medially keeled.

In the female received from the Stockholm Museum the thick yellow pubescence posteriorly extends to the posterior margin of abdominal tergite I, but anteriorly not beyond the anterior margin of the scutellum. In the female from Camiguin the wings are rosy purple, and apically with a greenish golden tint; the head is without pale hairs; the lateral surfaces of the thorax are black-haired posteriorly; the extreme basal portion of the wings is black-haired; the supraclypeal region is evenly punctate; the coronal suture is recognizable at its extreme base and the vertex is without a median impunctate band.

Female, length of body, 23 to 24 millimeters; anterior wing, 22 to 23.

Specimens examined.—Camiguin Island, one female, July 16, Böttcher, Deutsches Entomologisches Institut (det. Schulthess); "Philippine," one female, Stockholm Museum.

XYLOCOPA CANARIA (Ckll. et LeVeq.).

Female.—Apparently a slight variation of *X. blüthgeni* Dusm., which is allied to the preceding species. Wings a beautiful

green, with a slightly golden tint, basally with a slight purplish luster. Posterolateral portions of mesonotum, base of tegulæ, and extreme basal portion of wings all yellow-haired. Dorsal surface of anterior tibiæ with a very narrow band of yellow hairs. Posterior half of abdominal tergite I black-haired. Epistomal suture weakly ridged. Mandibles similar to those of *X. cuernosensis* (Ckll.). Minimum length of genæ about twice diameter of mandibular punctures. Vertex punctate in second-degree density. Interocellar distance to ocello-ocular distance 9:13. Antennal segment III about seven-eighths as long as segments IV to VI; segment IV broader than long, distinctly shorter than V. Wing veins M and M_{1+2} (1st section) subequal in length. Knee caps on posterior tibiæ extending to basal half of tibial length. Punctures on median portion of abdominal tergites in second-degree density, interspaces between proximate rows of punctures mostly shorter than punctual diameter.

Specimens examined.—Ipil, Talibon, one female, Stockholm Museum.

XYLOCOPA BLÜTHGENI Dusm.

Female.—Differing from *X. ghilianii* Grib., as described above, in the following characters: Wings with a little more violaceous luster. Front covered with an intermixture of yellowish and black hairs. Occiput with dominant black and very scattered bright yellow hairs. Black-haired patch in the center of mesonotum less extensive. Postscutellum purely yellow-haired. Dorsal surface of anterior tibiæ with a narrow yellow band. Abdominal tergite I extensively covered with yellow hairs, with very short black hairs present only along extreme posterior margin. Median fovea of frontal keel interrupted. Epistomal suture very weakly ridged. Genæ slightly shorter. Coronal suture recognizable at its extreme base. Antennal segment III about five-sixths as long as segments IV to VI; segment IV shorter than broad, distinctly shorter than V. Median impunctate band of scutellum narrow. Wing vein M longer than M_{1+2} (1st section).

Female, body, 19 to 21 millimeters long; anterior wing, 20.

Specimens examined.—"Philippine," one female, Stockholm Museum.

Many of the Philippine "species" belonging to the genus *Xylocopa* Latr. are known from one sex, usually the female, and on many occasions they are known solely from the type locality. The validity of many names, especially those of the *philippinensis*

and *ghilianii* groups, can be justified only by extensive collection in various localities. Probably some of the names will be treated as synonyms, slight individual variations, or geographical races.

XYLOCOPA CUERNOSENSIS (Ckll.).

Female.—The following notes may be added to the original description given by Cockerell: Wings darkest at cell Sc + R_1 + R_2 and cell R, basally with rosy purple luster. Lower portion of postgenæ ("cheeks" of Cockerell) covered with a mixture of reddish and black hairs. Postscutellum medially black-haired, laterally with dominant ferruginous and a few black hairs. Extreme basal portion of wings with little ferruginous hairs. Apex of abdomen ferruginous-haired. Interorbital distance at level of antennal fossæ about four-fifths verticoclypeal distance. Inner orbits moderately curved, distance between upper orbital extremities distinctly longer than between lower. Face coarsely and evenly punctate in first-degree density. Frontal keel ("ridge between antennæ" of Cockerell) weak, broad, extending to level of antennal fossæ. Supraclypeal region sparsely punctate, without median impunctate band. Epistomal suture ridged. Clypeal sutures strongly curved. Tentorial pits shallow, elongate. Basal portion of clypeus distinctly more elevated than its neighboring lateral frontal regions. Mandibles smooth, basal triangular area coarsely punctate, not depressed, and without distinct demarcation from median keel or outer marginal suture. Genæ impunctate, minimum length about 4 times diameter of mandibular punctures. Upper portion of outer orbital margins with a very deep and rather broad groove. Postgenæ coarsely and very scatteredly punctate in second-degree density, upper portion scarcely punctate. Vertex coarsely punctate in first-degree density. Coronal suture represented by median impunctate band on vertex. Interocellar distance about five-eighths ocello-ocular distance. Basal side of ocellar triangle about two and one-half times either one of the lateral sides. Interspaces between lateral ocelli and inner orbits a little more sparsely punctate. Interantennal distance and antenno-ocular distance subequal. Antennal segment III longer than segments IV to VI; segments V and VI subequal. Dorsum of thorax evenly punctate in first-degree density, except disc of mesonotum and median band of scutellum, which are impunctate. Wing vein M slightly longer than M_{1+2} (1st section); vein r-m ("first t. c." of Cockerell) complete; vein R_4 angulate at a point of basal two-thirds

of its length. Knee caps on posterior tibiæ ("scalelike process on hind tibiæ" of Cockerell) extending to basal half of tibial length. Inner teeth of anterior and posterior claws about three-fifths and one-half, respectively, as long as corresponding outer teeth. Abdominal tergites I to IV medially rather sparsely punctate in second-degree density, laterally in first-degree density; tergite I bipunctate; median furrow of epipygium narrow. Posterior portion of hypopygium weakly keeled.

The specimen before me differs from Cockerell's original description in three respects: lower part of postgenæ not with only long black hair, antennal segment III not a trifle longer than next three segments together, and wing vein r-m complete.

Specimens examined.—Ipil, Talibon, one female, Stockholm Museum.

XYLOCOPA BOMBIFORMIS F. Sm.

Female.—Here redescribed as follows:

Black, antennal segments IV to XII testaceous below. Wings fuscous, darkest at cell Sc + R_1 + R_2 with beautiful purple luster, apically with bluish-green iridescence. Pubescence entirely black. Interorbital distance at level of antennal fossæ to verticoclypeal distance 10: 13. Inner orbits very weakly curved, distance between upper orbital extremities a little greater than that between lower. Face strongly punctate in first-degree density, except interspaces between lateral ocelli and inner orbits, where it is punctate in third-degree density. Frontal keel comparatively strong, roundly ended, with a weak median fovea. Supraclypeal region medially impunctate. Epistomal suture almost straight, very weakly ridged. Clypeal suture strongly curved. Tentorial pits small. Clypeus laterally slightly more elevated than its neighboring lateral frontal regions; median impunctate band narrow, weakly carinate. Labrum tuberculate; apical emargination broad, shallow. Genæ impunctate, minimum length about twice diameter of mandibular punctures. Outer orbital margins with a deep groove. Postgenæ very scatteredly punctate in third-degree density. Vertex evenly and strongly punctate in first-degree density, without median impunctate band, region posterior to upper orbital extremities scatteredly punctate in second-degree density. Coronal suture irrecognizable. Interocellar distance about one-half ocello-ocular distance. Basal side of ocellar triangle about thrice either lateral side. Postocellar pits shallow, round. Length of interan-

tennal distance to antenno-ocular distance 13:16. Antennal segment III about nine-tenths of segments IV to VI; segments V and VI subequal. Dorsum of thorax strongly punctate in first-degree density, except disc of mesonotum and median band of scutellum, which are impunctate. Wing vein M about one and two-fifths as long as M_{1+2} (1st section); vein R_4 weakly angulate at a point of basal two-thirds of its length. Knee caps on posterior tibiæ small, V-shaped, extending to basal half of tibial length. Inner teeth of anterior and posterior claws about three-fifths and one-half as long, respectively, as corresponding outer teeth. Median portion of abdominal tergites strongly punctate in second-degree density, without distinct median impunctate band except on tergites III and IV; median furrow of epipygium shallow, very narrow. Posterior margin of abdominal sternites with a weak median extension. Hypopygium medially keeled.

Female, body, 25 to 26 millimeters long; anterior wing, 24 to 26.

The symbiotic acari, *Dinogamasus ramaleyi* LeVeq., found in the pouch of *X. bombiformis* F. Sm., is the same species found on *X. philippinensis* F. Sm. According to the findings of Miss LeVeque, in the case of the same species of acari taken from more than one species of bees, the hosts are very closely related. But judging from the female characters (I have not seen the male), there appears to be no true affinity between these two carpenter bees.

Specimens examined.—Los Baños, Baker, one female, Deutsches entomologisches Museum; Mamayan, one female, Stockholm Museum.

CHECK LIST OF THE PHILIPPINE SPECIES OF XYLOCOPA

Genus XYLOCOPA Latr. (1802)

Subgenus BILUNA Maa (1938)

XYLOCOPA (BILUNA) NASALIS FALLAX (Maidl) comb. nov.

"Philippine Islands" (Palawan?); males and females.

XYLOCOPA (BILUNA) NASALIS MCGREGORI (Ckll.).

LUZON; 1 male and 1 female.

XYLOCOPA (BILUNA) NASALIS MCGREGORI aber. THOMPSONI (Ckll.) comb. nov.

LUZON; 1 male.

XYLOCOPA (BILUNA) NASALIS MIMETICA (Ckll.) comb. nov.

PALAWAN; 1 male.

Subgenus ZONOHIRSUTA Maa (1938)

XYLOCOPA (ZONOHIRSUTA) MAZARREDOI Dusm.

PALAWAN; 1 female.

XYLOCOPA (ZONOHIRSUTA) COLLARIS FULIGINATA (J. Per.) comb. nov.

LUZON, MINDANAO, SAMAR, BASILAN, MINDORO, BOTEL TOBAGO; males and females.

XYLOCOPA (ZONOHIRSUTA) COLLARIS FULIGINATA aber. INDECISA (Ckll. et LeVeq.) comb. nov.

SAMAR; 1 female.

Subgenus ORBITELLA Maa (1938)

XYLOCOPA (ORBITELLA) TRIFASCIATA Grib.

MINDANAO; 1 female.

XYLOCOPA (ORBITELLA) GHILIANII (Grib.).

MINDANAO, SAMAR; 1 female.

XYLOCOPA (ORBITELLA) EUCHLORA J. Per.

MINDANAO, PALAWAN; 1 male.

XYLOCOPA (ORBITELLA) CANARIA (Ckll..LeVeq.).

SAMAR; males and females.

XYLOCOPA (ORBITELLA) LUCBANENSIS (Ckll.) comb. nov.

LUZON; 1 female (? male).

XYLOCOPA (ORBITELLA) BLÜTHGENI Dusm.

MINDANAO, BASILAN; 1 female.

XYLOCOPA (ORBITELLA)) SAMARENSIS (Ckll.-LeVeq.) comb. nov.

SAMAR; 1 female.

XYLOCOPA (ORBITELLA), CHLORINA (Ckll.)

LUZON; males and females.

XYLOCOPA (ORBITELLA) CEBALLOSI Dusm.

LUZON; 1 female.

XYLOCOPA (ORBITELLA) TAYABANICA (Ckll.) comb. nov.

LUZON; 1 female.

XYLOCOPA (ORBITELLA) BILINEATA (Friese).

LUZON; 1 female.

XYLOCOPA (ORBITELLA) PHILIPPINENSIS F. Sm.

LUZON; 1 female.

XYLOCOPA (ORBITELLA) NEGLIGENDA Maa.

TAYANITO MAI; 1 female.

XYLOCOPA (ORBITELLA) ADUSTA J. Per.

MINDANAO; 1 female.

XYLOCOPA (ORBITELLA) OCCIPITALIS J. Per.

MINDANAO; 1 male.

XYLOCOPA (ORBITELLA) SUBVOLATILIS (Ckll.) comb. nov.

MINDANAO; 1 female.

XYLOCOPA (ORBITELLA) QUERNOSENSIS (Ckll.).

NEGROS, PANAY, CEBU; 1 female.

XYLOCOPA (ORBITELLA) DAPITANENSIS (Ckll.) comb. nov.

MINDANAO; 1 female.

XYLOCOPA (ORBITELLA) BAKERIANA (Ckll.) comb. nov.

LUZON; males and females.

XYLOCOPA (ORBITELLA) SULCIFRONS J. Per.

PALAWAN; 1 female.

XYLOCOPA (ORBITELLA) AMAUROPTERA J. Per.

PALAWAN; 1 female.

XYLOCOPA (ORBITELLA) VACHALI J. Per.

PALAWAN; 1 female.

XYLOCOPA (ORBITELLA) BOMBIFORMIS F. Sm.

LUZON; males and females.

Subgenus PLATYNOPODA Westw. (1840)

XYLOCOPA (PLATYNOPODA) LATIPES (Drury).

NEGROS, PALAWAN; males and females.

SPECIES WRONGLY OR DOUBTFULLY RECORDED FROM THE PHILIPPINE ISLANDS

Xylocopa (*Nyctomelitta*) *tranquebarica* (Fabr.).
Xylocopa (*Biluna*) *nasalis nasalis* Westw.
Xylocopa (*Biluna*) *nasalis iridipennis* (Lepel.).
Xylocopa (*Zonohirsuta*) *collaris collaris* Lepel.
Xylocopa (*Zonohirsuta*) *collaris nigrocærulea* (F. Sm.).
Xylocopa (*? Zonohirsuta*) *sororina* F. Sm.
Xylocopa (*Alloxylocopa*) *appendiculata* F. Sm.
Xylocopa (*Orbitella*) *ceylonica* Cam. (= *Clavicrus* Maidl).
Xylocopa (*Orbitella*) *confusa* J. Per.
Xylocopa (*Orbitella*) *bryorum* (Fabr.).
Xylocopa (*Orbitella*) *tricolor* Rits.
Xylocopa (*Orbitella*) *leucocephala* Rits.
Xylocopa (*Platynopoda*) *tenuiscapa* Westw.

A NEW ANTENNOPHORID MITE, RIDER OF THE PHILIPPINE ANT ÆNICTUS MARTINI

By Arthur Paul Jacot

Of the United States Forest Service, New Haven, Connecticut

ONE TEXT FIGURE

The specimens on which this paper is based were sent me by Dr. J. W. Chapman, of Siliman University, with a request for determination. After several futile attempts at determining the genus, I sent the specimens to Dr. Hermann Graf Vitzthum for determination, and description, if new. Doctor Vitzthum returned them to me with the advice that he thought they represent a new family related to the antennophorids, certainly a new subfamily of this group. As I am not familiar with this family I am unable to characterize such a group but proceed to describe the species and genus.

Genus ÆNICTEQUES novum

Body elongate, oval, depressed; dorsal shield of male narrower and shorter than ventral, produced anteriad over mouth parts which are invisible from above and seem much reduced; legs 1 long, stout, tarsus the longest segment, without ambulacrum or claws; stigmata posterolaterad of legs 4; male genital aperture on transverse plane passing between legs 2 and 3 (text fig. 1, *a*); female genital area formed of a median triangular plate, a lateral plate (each side) which is broadest at anterior end and bears two bristles, and an anterior transverse plate (text fig. 1, *e*); ambulacra of legs 2 to 4 without hooks (text fig. 1, *b*).

Type: *Aenicteques chapmani* sp. nov.

ÆNICTEQUES CHAPMANI sp. nov.

Body sculptured with net pattern, armed with short and long bristles (text fig. 1, *a*); plates of dorsum and venter joined by unpigmented membrane; anterior edge of dorsal plate with a pair of bristle-bearing nubbins (text fig. 1, *a*); sides with a series of such nubbins; lateral plate (parapodial?) of venter armed on transverse plane passing between legs 2 and 3 with a triangular, distally emarginate spur which projects beyond sides of body (text fig. 1, *a*); dorsal plate with a marked, transverse depression behind transverse plane of legs 4; a deep constriction

between ventral and thoracic (epigynal and lateral) plates; center of thoracic (sternal) plate of males longitudinally depressed; transverse plate of genital area of females smooth; a cluster of pseudofissuræ (lyriform organs) at anterolateral corners of lateral plates of females; distal end of tarsi 1 furnished with short, stout, curved bristles (text fig. 1, *d*); coxæ of legs 1 with prominent ventrolateral angles especially at proximal end (text fig. 1, *a*).

Females bear a maximum of three eggs at one time.

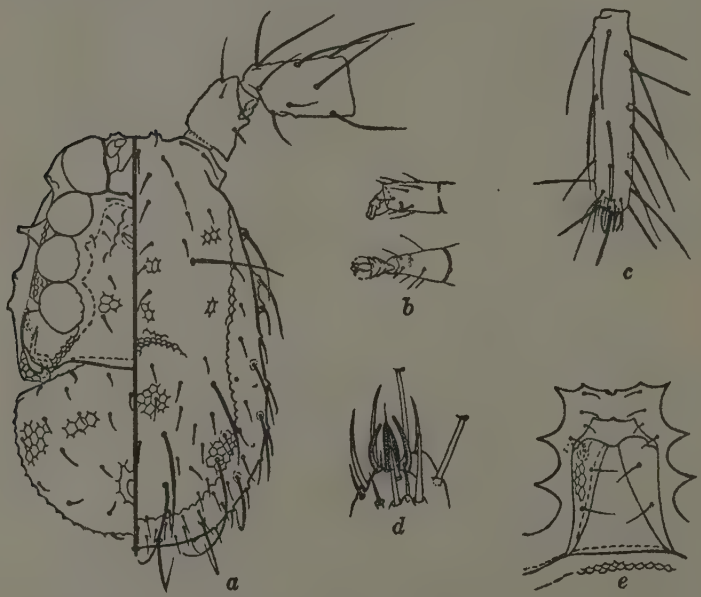

FIG. 1. *Ænicteques chapmani* gen. et sp. nov. *a*, Dorsoventral aspects of male, legs omitted; *b*, distal half of tarsi 3 and 4, lateral aspect above, dorsal aspect below; *c*, tarsus 1, dorsal aspect; *d*, distal end of tarsus 1, 4.4 times larger than in *c*; *e*, ventral aspect of ventral plates of female thorax.

Largest female, length, 1 millimeter; breadth, 0.7.

Male, length, 0.85 millimeter; breadth, 0.68.

Cotypes, 4 males, 17 females, taken by Dr. J. W. Chapman from workers of the ant *Ænictus martini* Forel, Philippines, mounted on two slides, to be deposited in the Museum of Comparative Zoölogy, Harvard University.

Doctor Chapman writes that the mites ride astraddle the head of the workers with legs extended forward and frequently palpated by the antennæ of the ant.

ILLUSTRATION

TEXT FIGURE

FIG. 1. *Ænicteques chapmani* gen. et sp. nov. *a*, Dorsoventral aspects of male, legs omitted; *b*, distal half of tarsi 3 and 4, lateral aspect above, dorsal aspect below; *c*, tarsus 1, dorsal aspect; *d*, distal end of tarsus 1, 4.4 times larger than in *c*; *e*, ventral aspect of ventral plates of female thorax.

OCCURRENCE AND SEASONAL DISTRIBUTION OF MARINE PLANKTONIC DIATOMS FROM TSINGTAO AND ITS VICINITY

By T. G. CHIN

Of the Marine Biological Station, University of Amoy, China

ONE TEXT FIGURE

The planktonic diatoms listed in this paper were collected at Tsingtao and its vicinity, in northeastern China, 36° 5′ north latitude and 120° 18′ east longitude, from the localities of Little Tsingtao, Great Wharf, Small Wharf, and Chang Kao. The two first-named localities contributed most of the samples, while the latter two yielded only one collection each. Altogether thirty-nine samples were examined, from May, 1936, to March, 1937. Fifty-seven species of diatoms were found, 18 of them not found in Amoy waters.[1]

Sincere thanks are due to Dr. S. W. Ling, former head of the Department of Biology, National University of Shantung, Tsingtao, for collecting the samples and for furnishing me a table of records relating to the samples, and to Dr. T. Y. Chen, Director of the Marine Biological Station, National University of Amoy, for valuable criticism.

PARALIA SCULATA (Ehr.) Cleve.

Paralia sculata (Ehr.) CLEVE (1873); CHIN (1937) 43, fig. 5.

Very rare in Little Tsingtao. Found in May and June, 1936, and February and March, 1937. Present in Amoy sea.

STEPHANOPYXIS PALMERINA (Grev.) Grunow.

Stephanopyxis palmerina (Grev.) GRUNOW (1884); CHIN (1937) 51, fig. 22.

Little Tsingtao, October and November, 1936. Rare. Common in Amoy.

STEPHANOPYXIS TURRIS (Grev. & Arn.) Ralfs.

Stephanopyxis turris (Grev. & Arn.) RALFS (1861); HUSTEDT (1928) 304, fig. 140.

Creswellia turris GREVILLE et ARNOTT (1857).

[1] Chin, Amoy Mar. Biol. Bull. (2) 3 (1937) 37–80.

Stephanopyxis appendiculata EHRENBERG (1854).
Stephanopyxis turgida RALFS (1861).
Stephanopyxis cylindrica EHRENBERG (1872).

Cells cylindrical, usually longer than broad. Diameter 45 μ, more or less. Areolæ 3 or 4 in 10 μ. Spines on each valve usually 9 or 10.

Little Tsingtao, common in October and November, 1936, rather rare in February, 1937. Not found in Amoy. First record for China Coast.

CYCLOTELLA STRIATA (Kütz.) Grunow.

Cyclotella striata (Kütz.) GRUNOW (1881); CHIN (1937) 49, fig. 18.

Little Tsingtao, rare; May, June, and October, 1936. Not common in Amoy.

SKELETONEMA COSTATUM (Grev.) Cleve.

Skeletonema costatum (Grev.) CLEVE (1878); CHIN (1937) 56, fig. 21.

Present in Little Tsingtao, Great Wharf, and Small Wharf, October, November, and December, 1936; and January, February, and March, 1937. Found in Amoy.

ACTINOCYCLUS RALFSII (W. Sm.) Ralfs.

Actinocyclus ralfsii (W. Sm.) RALFS, 1842; V. HEURCK (1896) 523, pl. 23, fig. 658.
Eupodiscus Ralfsii W. SM.

Cells disc-shaped, with large submarginal pseudonodule. Puncta interrupted by very numerous subulate hyaline spaces. Margin furnished with small spines, in every 10 μ. Puncta very fine, 14 in 10 μ. Diameter 100 to 130 μ.

Present in October in Little Tsingtao. Not reported from Amoy. First record for China Coast.

COSCINODISCUS EXCENTRICUS Ehrenberg.

Coscinodiscus excentricus EHRENBERG (1839); CHIN (1937) 45, fig. 7.

Present in October and December in Little Tsingtao. Recorded in Amoy plankton.

COSCINODISCUS LINEATUS Ehrenberg.

Coscinodiscus lineatus EHRENBERG (1838); CHIN (1937) 45, fig. 8.

Rare in Little Tsingtao and Chang Kao, in May, October, and November. Found in Amoy.

COSCINODISCUS JANISCHII A. Schmidt.

Coscinodiscus janischii A. SCHMIDT (1878); CHIN (1937) 46, fig. 10.

Rare in October and November, 1936, and March, 1937, in Little Tsingtao. Occurs in Amoy.

COSCINODISCUS ASTEROMPHALUS Ehrenberg.

Coscinodiscus asteromphalus EHRENBERG (1844); CHIN (1937) 46, fig. 11.

Little Tsingtao, October and December, 1936. Common in Amoy.

COSCINODISCUS RADIATUS Ehrenberg.

Coscinodiscus radiatus EHRENBERG (1839); GRAN (1905) 31, fig. 31; LEBOUR (1930) 39, fig. 15.

Cells flat, disc-shaped, 30 to 180 μ in diameter. No apicules. Areolæ uniform in size, 6 to 8 in 10 μ, radiating from the center. Oceanic.

Very common in Little Tsingtao and Great Wharf. Found nearly in every month. Not reported from Amoy. Recorded in Ningpoo, Chekiang, by Petit.

ACTINOPTYCHUS UNDULATUS (Bailey) Ralfs.

Actinoptychus undulatus (Bailey) RALFS (1861); CHIN (1937) 47, fig. 13.

Very rare in Little Tsingtao. Found only once in October, 1936. Present in Amoy.

CYCLOTELLA COMTA (Ehr.) Kützing.

Cyclotella comta (Ehr.) KÜTZING (1849); CHIN (1937) 49, fig. 17.

Only found once in November in Little Tsingtao. Found in Amoy.

LEPTOCYLINDRUS DANICUS Cleve.

Leptocylindrus danicus CLEVE (1889); GRAN (1905) 24, fig. 24; LEBOUR (1930) 77, fig. 52. GRAN and ANGST (1931) 457, fig. 35; ALLEN and CUPP (1935) 125, fig. 27.

Cells cylindrical, two to five times longer than broad, united in a straight chain. Valves flat or convex, without visible sculpturing. Diameter 6 to 11 μ. Chromatophores numerous. North temperate species. Neritic?

Rather rare in Little Tsingtao, in October, 1936, and January to March, 1937. Not found in Amoy. First record for China Coast.

RHIZOSOLENIA STOTERFORTHII H. Peragallo.

Rhizosolenia stoterforthii H. PERAGALLO (1888); CHIN (1937) 54, fig. 28.

Commonly found in Little Tsingtao, Great Wharf, and Small Wharf, in nearly every month. Also common in Amoy.

RHIZOSOLENIA ALATA fo. INDICA Brightwell.

Rhizosolenia alata fo. *indica* BRIGHTWELL (1858); CHIN (1937) 55, fig. 20.

Very common in Tsingtao and its vicinity; specimens found in every collection. Other forms of this species have never been found. Present in Amoy, but not as abundantly as in Tsingtao.

RHIZOSOLENIA SETIGERA Brightwell.

Rhizosolenia setigera BRIGHTWELL (1858); CHIN (1937) 56, fig. 33.

Present from October, 1936, to March, 1937, in moderate numbers. Collected from Little Tsingtao, Great Wharf, and Small Wharf. Occurs in Amoy.

CHAETOCEROS PERUVIANUS Brightwell.

Chaetoceros peruvianus BRIGHTWELL (1858); CHIN (1937) 58, fig. 36.

Found in Little Tsingtao, Great Wharf, and Small Wharf, from October, 1936, to March, 1937. Very rare. Rare also in Amoy.

Chain straight, 16 to 40 μ broad. Cells densely arranged, gaps small. Valve nearly rounded. Valve mantle low, girdle clearly separated from it by a constriction. Setæ thick, with spines, perpendicular to the chain. Chromatophores numerous, present in setæ. End cells different from the rest, by the valve being strongly rounded with the setæ arising near the center, or flat with the setæ arising near the margin. Oceanic, temperate.

Present from October, 1936, to March, 1937, in Little Tsingtao, Great Wharf, and Small Wharf. Not yet reported from Amoy. First record for China Coast.

CHAETOCEROS MITRA (Bail.) Cleve.

Chaetoceros mitra (Bail.) CLEVE (1896); GRAN (1905) 75, fig. 89; IKARI (1928) 258, fig. 12; LEBOUR (1930) 128, fig. 92; HUSTEDT (1930) 677, fig. 384.
Dicladia Groenlandicus CLEVE (1873).
Dicladia mitra BAILEY (1880).

Vegetative cells very much like *C. decipiens*, but the resting spores different. Valve faces of resting spores different, primary valve elevated into two large cones, bearing a solid stem

and many branches, secondary valve smooth and vaulted, with two low peaks.

Only one chain with spores found October 6, 1936, in Little Tsingtao. Not found in Amoy. First record for China Coast.

CHAETOCEROS TERES Cleve.

Chaetoceros teres CLEVE (1896); GRAN (1905) 76, fig. 91; IKARI (1928) 260, fig. 13*a*; LEBOUR (1930) 130, fig. 94; HUSTEDT (1930) 681, fig. 386.

Chain straight, 18 to 48 μ broad. Gaps usually very narrow. Cells oblong in broad girdle view with sharp corners. Setæ thin, almost perpendicular to the chain, arising obliquely on both sides of the apical plane. Valve mantle low, girdle zone high, no constriction between. Chromatophores numerous. Neritic. North temperate species.

Present in October in Little Tsingtao. Not found in Amoy. Reported from Japan. First record for China Coast.

CHAETOCEROS PSEUDOCURVISETUM Manguin.

Chaetoceros pseudocurvisetum MANGUIN (1910); IKARI (1926) 529, fig. 12; LEBOUR (1930) 159, fig. 122*a*; HUSTEDT (1930) 739, fig. 427.

Chains curved, cells compressed, slightly fused at their corners. Valve with four protuberances connected with similar knobs on adjacent valve. Gaps lenticular. Neritic.

Present in October in Little Tsingtao. Not found in Amoy. Reported from Japan. First record for China Coast.

CHAETOCEROS CURVISETUM Cleve.

Chaetoceros curvisetum CLEVE (1889); LEBOUR (1930) 156, fig. 120; GRAN (1905) 91, fig. 116; HUSTEDT (1930) 737, fig. 426.

Chains curved, 10 to 29 μ broad. End cells not differentiated. Cells oblong in broad girdle view, with conspicuous corners. Gaps rhombo-elliptical to circular. Setæ all bent towards same side of chain. Chromatophores 1 per cell. Neritic. Temperate.

October 16, 1936. Very rare. Not found in Amoy. First record for China Coast.

CHAETOCEROS LORENZIANUS Grunow.

Chaetoceros curvisetum CLEVE (1889); LEBOUR (1930 156, fig. 120; LEBOUR (1930) 128, fig. 93; HUSTEDT (1930) 679, fig. 385.

Chains straight, usually short, 20 to 50 μ broad. Gaps polygonal to elliptical. Setæ enlarged near ends, strongly punctate, especially terminal setæ.

October 16, 1936; very rare. Not found in Amoy. Recorded in Hongkong by Lauder.

CHAETOCEROS BREVIS Schütt.

Chaetoceros brevis SCHÜTT (1895); GRAN (1905) 83, fig. 100; LEBOUR (1930) 139, fig. 101; HUSTEDT (1930) 707, fig. 403.

Chains straight, 20 μ broad, gaps oval to oblong. Valve center slightly projected. Setæ thin, arising near corners, joined with adjacent cells. Chromatophore 1. Neritic. Temperate.

October 16, 1936. Very rare. Not found in Amoy. First record for China Coast.

CHAETOCEROS DITYMUS Ehrenberg.

Chaetoceros ditymus EHRENBERG (1845); CHIN (1937) 60, fig. 42.

Found only October 16, 1936, in Little Tsingtao. Present in Amoy.

CHAETOCEROS EIBENII (Grun.) Chin.

Chaetoceros eibenii (Grunow, 1881); CHIN (1937) 58, fig. 38.

Only once collected from Great Wharf, March 6, 1937. Present in Amoy.

CHAETOCEROS DECIPIENS Cleve.

Chaetoceros decipiens CLEVE (1873); CHIN (1937) 60, fig. 43.

Little Tsingtao, Great Wharf, and Small Wharf, from October, 1936, to March, 1937. Occurs in Amoy.

CHAETOCEROS AFFINIS var. WILLEI (Gran) Hustedt.

Chaetoceros affinis var. *Willei* (Gran) HUSTEDT (1930); HUSTEDT (1930) 697, fig. 398; GRAN (1905) 81, fig. 98.

Chaetoceros Willei GRAN (1897).

Chains straight, 10 to 20 μ broad. Cells delicate, gaps between cells small, setæ scarcely thickened. Other characters resembling *C. affinis*.

Little Tsingtao, December 1, 1936. Not found in Amoy. First record for China Coast.

CHAETOCEROS AFFINIS var. CIRCINALIS (Meunier) Hustedt.

Chaetoceros affinis var. *circinalis* (Meunier) HUSTEDT (1930) 697, fig. 397.

Chaetoceros Schuttii var. *circinalis* MEUNIER (1913).

Setæ curved, perpendicular to the chain, meeting each other in the valve view to take the shape of a section of a spinal cord.

Present in October and November, 1936. Not found in Amoy. First record for China Coast.

CHAETOCEROS DENSUS Cleve.

Chaetoceros densus CLEVE (1901); GRAN (1905) 67, fig. 79; LEBOUR (1930) 115, fig. 81; HUSTEDT (1930) 651, fig. 368.
Chaetoceros borealis var. *densa* CLEVE (1897).

BACTERIASTRUM HYALINUM Lauder.

Bacteriastrum hyalinum LAUDER (1864); CHIN (1937) 53, fig. 25.

Little Tsingtao, October and November, 1936; rare. Common in Amoy.

TRICERATIUM FAVUS Ehrenberg.

Triceratium favus EHRENBERG (1841); CHIN (1937) 63, fig. 50.

Little Tsingtao, October 16, 1936, and January 1, 1937. Occurs in Amoy.

DITYLIUM BRIGHTWELLII (West) Grunow.

Ditylium brightwellii (West) GRUNOW (1881); CHIN (1937) 65, fig. 55.

Little Tsingtao, common from October to December, 1936, and February, 1937. Also common in Amoy.

DITYLIUM SOL Grunow.

Ditylium sol GRUNOW (1881); CHIN (1937) 66, fig. 56.

Little Tsingtao, Small Wharf, and Great Wharf, January, February, and March, 1937. Rather rare in Amoy.

BIDDULPHIA LAEVIS Ehrenberg.

Biddulphia laevis EHRENBERG (1843); CHIN (1937) 61, fig. 45.

Little Tsingtao, October 16, 1936, and Great Wharf, January 1, 1937; very rare. Occurs in Amoy.

BIDDULPHIA SINENSIS Greville.

Biddulphia sinensis GREVILLE (1886); CHIN (1937) 62, fig. 46.

Little Tsingtao, common from October to December, 1936; less common in February and March, 1937. Very common in Amoy.

BIDDULPHIA MOBILIENSIS (Bail.) Grunow.

Biddulphia mobiliensis (Bail.) GRUNOW (1885); CHIN (1937) 62, fig. 48.

Little Tsingtao, October to December, 1936, and February, 1937; very rare. Rare in Amoy plankton.

HEMIAULUS HAUCKII Grunow.

Hemiaulus hauckii GRUNOW (1881); CHIN (1937) 64, fig. 52.

Little Tsingtao, October, 1936; very rare. Present in Amoy.

HEMIAULUS SINENSIS Greville.

Hemiaulus sinensis GREVILLE (1865); CHIN (1937) 64, fig. 53.

Little Tsingtao, May to November, 1936; very rare. Present in Amoy.

EUCAMPIA ZODIACUS Ehrenberg.

Eucampia zodiacus EHRENBERG (1839); CHIN (1937) 66, fig. 57.

Found only once, October 6, 1936, in Little Tsingtao; rare. Commonly collected in Amoy waters.

STREPTOTHEA THAMENSIS Shrubs.

Streptothea thamensis SHRUBS (1890); GRAN (1905) 101, fig. 131; LEBOUR (1930) 191, fig. 150.

Cells almost square, flat, strongly twisted. Valve with knobs which fit into corresponding depressions in the adjacent cells. Chain 40 to 120 μ broad. Neritic. Arctic species.

Little Tsingtao, common in October and November, 1936. Not reported from Amoy. First record for China Coast.

FRAGILARIA STRIATULA Lyngbye.

Fragilaria striatula LYNGBYE (1819); CHIN (1937) 68, fig. 60.

Only found twice in Little Tsingtao, June and November, 1936; rare. Rare also in Amoy.

ASTERIONELLA JAPONICA Cleve.

Asterionella japonica CLEVE (1882); CHIN (1937) 69, fig. 62.

Found in October, 1936, and February and March, 1937. Very rare in Little Tsingtao and Small Wharf, but very common in Great Wharf. Rare in Amoy.

THALASSIOTHRIX LONGISSIMA Cleve and Grunow.

Thalassiothrix longissima CLEVE & GRUNOW (1880); CHIN (1937) 70, fig. 66.

Great Wharf, March 12, 1937. Occurs in Amoy.

THALASSIOTHRIX FRAUENFELDII (Grunow) Cleve and Grunow.

Thalassiothrix frauenfeldii (Grunow) CLEVE & GRUNOW (1880); CHIN (1937) 70, fig. 66.

Present in Little Tsingtao and Great Wharf. Commonly collected in Amoy.

THALASSIOTHRIX NITZSCHIOIDES Grunow.

Thalassiothrix nitzschioides GRUNOW (1881); CHIN (1937) 71, fig. 67.

Occurs in every month in limited numbers, in Little Tsingtao, Great Wharf, and Small Wharf. Occurs in Amoy waters.

GRAMMATOPHORA MARINA (Lyngbye) Kützing.

Grammatophora marina (Lyngbye) KÜTZING (1844); CHIN (1937) 71, fig. 68.

Little Tsingtao, June, 1936, and February, 1937; very rare. Rare in Amoy.

RHABDONEMA ADRIATICUM Kützing.

Rhabdonema adriaticum KÜTZING (1844); LEBOUR (1930) 202, fig. 104.

Cells in chains, with numerous curved septa and transverse rows of puncta. Valves linear-lanceolate, somewhat thickened at ends. Littoral. Temperate.

Little Tsingtao, June and October, 1936; very rare. Not reported from Amoy.

LICMOPHORA ABBREVIATA Agardh.

Licmophora abbreviata AGARDH (1867); CHIN (1937) 72, fig. 69.

Very common and usually abundant in Little Tsingtao and Great Wharf. Collected in every month. Present in Amoy.

COCCONEIS SCUTELLUM Ehrenberg.

Cocconeis scutellum EHRENBERG (1838); CHIN (1937) 73, fig. 72.

Only once collected in Little Tsingtao, June 2, 1936; very rare. Rare also in Amoy.

NAVICULA CANCELLATA Donkin.

Navicula cancellata DONKIN (1871); CHIN (1937) 74, fig. 74.

Rarely found in Tsingtao region. Rare in Amoy.

PLEUROSIGMA ANGULATUM W. Sm.

Pleurosigma angulatum W. SM. (1852); V. HEURCK (1896) 251, pl. 6, fig. 257.

Valve broadly lanceolate, sigmoid, median part slightly angular. Raphe sigmoid. All striæ almost equally delicate, 18 to 20 in 10 μ. Median oblique striæ not flexed. Length 150 to 190 μ. Neritic. North temperate.

Usually found in limited numbers. Not found in Amoy. Recorded in Foochow by Skvortzow.

PLEUROSIGMA AFFINE Grunow.

Pleurosigma affine GRUNOW (1873); V. HEURCK (1896) 252, pl. 6, fig. 263.

This species is very much like *P. angulatum*, but with more lanceolate and rather finer striæ, and with median oblique striæ flexed. Length 100 to 220 μ.

Very rare in Tsingtao. Not found in Amoy. Recorded in Nimrod Sound, Chekiang, by Petit, and in Dairen by Skvortzow.

BACILLARIA PARADOXA Gmelin.

Bacillaria paradoxa Gmelin (1788); CHIN (1937) 76, fig. 78.

Usually found in limited numbers in Little Tsingtao and in Great Wharf. Common in Amoy.

NITZSCHIA LONGISSIMA (Breb.) Gran.

Nitzschia longissima (Breb.) GRAN (1861); CHIN (1937) 76, fig. 79.

Little Tsingtao and Great Wharf, October, 1936, and January and February, 1937; very rare. Found in Amoy.

NITZSCHIA SERIATA Cleve.

Nitzschia seriata CLEVE (1883); CHIN (1937) 77, fig. 80.

Found in nearly every month in Little Tsingtao, Great Wharf, and Small Wharf. Also occurs in Amoy plankton.

NITZSCHIA DELICATISSIMA Cleve.

Nitzschia delicatissima CLEVE (1897); GRAN (1905) 130; LEBOUR (1930) 214, fig. 179.

Cells hairlike, very similar to those in *Nitzschia seriata*, but slenderer; 1.5 μ broad. Neritic.

Found only once, March 12, 1937, in Great Wharf. Not found in Amoy. First record for China Coast.

MONTHLY DISTRIBUTION

May, 1936.—Three collections were made at Little Tsingtao and one at Chun Kuo, each containing 3 to 5 species and very few individuals for each species. Most of the species found were different, so that a total of 10 species were obtained in this month.

June, 1936.—Ten collections were made in June, 1936, one of them from Great Wharf and the rests from Little Tsingtao. Only 16 species of diatoms were found, since each sample contained very few species and since most samples contained iden-

tical species. The number of individuals found during this month was the lowest in the present study.

July to September, 1936.—No sample was obtained during July to September, 1936, but the period was quite important because of the multiplication of diatoms, and the maximum of diatoms having occurred in this period. From the known data, especially for June and October, the writer believes diatoms increased suddenly in July and gradually in August, and reached the maximum in September or in October.

October, 1936.—Forty-seven species were found in October, 1936, in 5 samples from Little Tsingtao, and the number of individuals in each collection was also very high. Therefore October was probably the optimum month of the year for diatoms.

November, 1936.—Two collections were made in November, 1936, from Little Tsingtao, containing 26 species, but the average number of individuals in each collection was a little lower than in October.

December, 1936.—Only 1 sample was collected in December, 1936, from Little Tsingtao, containing 18 species, not much less than the average number for the preceding months, and the average number of individuals in each collection was the same as in October.

January, 1937.—Twelve species were found in January, 1937, in a single collection taken at Great Wharf. Both the number of species and the number of individuals were decreasing gradually.

February, 1937.—From the 5 collections made in February, 1937, in Little Tsingtao, Great Wharf, and Small Wharf, 25 species were obtained. The average number of species was less than that taken in January, and the average number of individuals was much less than that taken in the preceding months.

March, 1937.—Thirty-three species were found in March, 1937, in 11 collections from Little Tsingtao and Great Wharf. Both the average number of species and the average number of individuals were much less than those taken in February.

April, 1937.—No sample was available for study in April, 1937, but from the data of March, 1937, and May, 1936, the writer believes there was very little change, and the curve for diatoms must be smooth.

TABLE 1.—*Locality and date records of diatoms taken at Tsingtao and vicinity.*

Date.	Time of day.	Locality.	Collection No.	Ling & Su's Remarks.
		1936		
May 20	3–5 P. M.	Little Tsingtao	2	
May 22	3–5 P. M.	Chang Kao	3	
May 24	P. M.	Little Tsingtao	4	
May 29	P. M.	do	6	
June 2	P. M.	do	7	
June 3	8–10 P. M.	do	8	
June 4	3–5 P. M.	do	9	
June 5	2–4 P. M.	do	10	
June 6	2–4 P. M.	do	11	
June 6	7–9 P. M.	do	12	
June 9	2–4 P. M.	do	13	
June 12	3–5 P. M.	do	14	
June 13	3–6 P. M.	do	15	
June 18	9–11 A. M.	do	16	
October 6		do	A 1	
October 12	8 P. M.	do	A 2	
October 15		do	A 3	
October 16		do	A 4	
October 18		do	A 5	
November 10		do	A 6	
November 16		do	A 7	
December 1		do	17	Below 0° C.
		1937		
January 1		Great Wharf	18	Below 0° C.
February 19	3–5 P. M.	Little Tsingtao	19	
February 19	8–19 P. M.	do	20	
February 20	4–6 P. M.	Great Wharf	21	
February 20	6–7 P. M.	Small Wharf	22	
February 27	7–9 P. M.	Little Tsingtao	23	Along the coast.
March 1	4–6 P. M.	Great Wharf	24	
March 1	4–6 P. M.	do	25	Fine net.
March 1	7–9 P. M.	do	26	
March 1	7–9 P. M.	do	27	Do.
March 6	10–12 A. M.	do	28	
March 12	10–12 A. M.	do	29	
March 12	10–12 A. M.	do	30	Do.
March 21	10–12 A. M.	Little Tsingtao	31	
March 22	2–5 P. M.	Great Wharf	32	
March 28	10–12 A. M.	do	33	
March 28	6–8 P. M.	do	34	

DISCUSSION AND SUMMARY

1. Of the 57 species described, only 6 occurred more than fifteen times (that is, were present in more than half of the samples examined), namely, *Rhizosolenia alata* fo. *indica*, *R. stoterforthii*, *Thalassiothrix nitzschioides*, *Licmophora abbreviata*, *R. setigera*, and *Biddulphia sinensis*. These predominant species were cosmopolitan and also recorded in Amoy, but the periods of their maxima were different.

2. Eighteen species of diatoms from Tsingtao were not recorded from Amoy, namely, *Stephanopyxis turris, Actinocyclus Ralfsii, Coscinodiscus radiatus, Leptocylindrus danicus, Coscinodiscus affinis* var. *Willei, Chaetoceros affinis* var. *circinalis, Ch. densus, Ch. mitra, Ch. teres, Ch. pseudocurvisetum, Ch. curvisetus, Ch. Lorenzianus, Ch. brevis, Streptothea thamensis, Rhabdonema adriaticum, Pleurosima affine, Pl. angulatum,* and *Nitzschia delicatissima.* The rests were reported from Amoy.

3. The maximum period for the average number of species (21) and the average number of individuals (45) found monthly occurred in October. However, the writer believes that the maximum occurred in September, since no collection was made during that month. The minimum period occurred in June. As compared with the collections of Amoy planktonic diatoms, the seasons for the maximum and minimum occurred two or three months later in Tsingtao, which is north of Amoy. The seasonal distribution is shown in Table 2 and in text fig. 1.

TABLE 2.—*Seasonal distribution of planktonic diatoms at Tsingtao and vicinity.*

Data.	1936		1937							
	May.	June.	July–Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Number of species found	10	16	------	47	26	18	12	25	23	------
Collections made	4	10	------	5	2	10	1	5	11	------
Species for each collection in average.	4.2	4	------	21.4	19	18	12	11.6	7.1	------
Average individuals in each collection.	9	7	------	45	42	45	30	21	13	------

4. With regard to the time of day, afternoon collections on the surface gave the best results (an average of 10.6 species), followed by evening (an average of 7.5 species) and morning (an average of 7.3 species) collections, as penetration of light was best in the afternoon.

5. Samples collected December 1, 1936, and January 1, 1937, showed no difference from the other samples, although the temperature of sea water was below 0° C. Although the sample collected February 27, 1937, was taken along the coast, the diatoms taken were no less abundant in it than in samples taken away from the coast.

TABLE 3.—*Details of the collections of marine planktonic diatoms from Tsingtao and vicinity.*

[rr=very rare; r=rare; x=present; c=common; cc=very common; ccc=abundant.]

Species.	1936																				
	May.				June.										October.					November.		December.
	20	22	24	29	2	3	4	5	6	6	6	12	13	18	6	12	15	16	18	10	16	1
Paralia sculata				r	rr			rr														
Stephanopyxis Palmerina																rr		rr			rr	
Stephanopyxis turris															c	c	rr	x	x	rr	rr	
Cyclotella striata	rr				rr										rr							
Skeletonema costatum															r			rr			rr	c
Actinocyclus Ralfsii																		rr				
Coscinodiscus excentricus															c							rr
Coscinodiscus lineatus	rr		rr												rr					r		
Coscinodiscus janischii															rr	rr		c			rr	
Coscinodiscus asteromphalus															cc							r
Coscinodiscus radiatus						rr									c		rr	ccc	ccc	c	c	
Actinoptychus undulatus																		rr				
Cyclotella comta																					x	
Leptocylindrus danicus															rr	rr	rr		rr			
Rhizosolenia stoterforthii					rr		x	x	rr	rr					cc			x	c	x	r	c
Rhizosolenia alata fo. *indica*	c	x	c	x	x	rr	c	c	x	x	r	rr	rr	rr	c	r	rr	x	c	r	r	x
Rhizosolenia setigera															x	r	rr	x	r	rr	rr	c
Chaetoceros peruvianus															x			rr		rr		r
Chaetoceros diadymus																		rr				
Chaetoceros eibenii																						
Chaetoceros decipiens															x		rr	rr	x	rr	x	c
Chaetoceros affinis var. *Willei*																						x
Chaetoceros affinis var. *circinalis*															rr			x		c		
Chaetoceros densus															x						x	r
Chaetoceros mitra															rr							

Chaetoceros teres															x			x				
Chaetoceros pseudocurvisetum															x			c				
Chaetoceros curvisetum																		rr				
Chaetoceros lorenzianus																		rr				
Chaetoceros brevis																		rr				
Bacteriastrum hyalium															x			rr		rr	rr	
Triceratium favus																	rr			r		rr
Ditylium Brightwellii															x	rr	rr	r	x	cc	x	c
Ditylium sol																						
Biddulphia laevis																		rr				
Biddulphia sinensis															x	rr	rr	x	cc	ccc	c	cc
Biddulphia mobiliensis															rr	rr		rr	rr	r	rr	rr
Hemiaulus hauckii															rr			rr				
Hemiaulus chinensis			rr				rr	r							r			rr	rr		rr	
Eucampia zodiacus															rr							
Streptotheca thamensis															x			c		rr		
Fragilaria striatula					x															rr		
Asterionella japonica															r			rr				
Thalassiothrix longissima																						
Thalassiothrix frauenfeldii															r	x		r	x	r	x	
Thalassiothrix nitzschioides	r		rr	r	r										rr		r	c	x	r		x
Grammatophora marina								r														
Rhabdonema adriaticum								rr										rr				
Licmophora abbreviata				x	ccc	rr			rr		x	rr	rr				rr				x	rr
Cocconeis scutellum					rr																	
Navicula cancellata	rr	x					rr	rr	rr					rr			rr					rr
Pleurosigma Normanii			rr																			
Pleurosigma affine		x								rr		rr			rr		rr	rr	rr			
Bacillaria paradoxa											rr				rr		rr	r	x	r	rr	rr
Nitzschia longissima																rr						
Nitzschia seriata					rr												rr					
Nitzschia delicatissima																						
Number of species found.	5	3	5	4	9	3	4	7	4	3	3	3	2	2	33	11	15	33	15	19	19	18

TABLE 3.—*Details of the collections of marine planktonic diatoms from Tsingtao and vicinity.*—Continued.

Species.	1937																Number of collections made.
	January.	February.					March										
	1	19	19	20	20	27	1	1	1	1	6	12	12	21	22	28	28	
Paralia sculata				rr												rr		5
Stephanopyxis Palmerina																		3
Stephanopyxis turris			rr															8
Cyclotella striata																		3
Skeletonema costatum	x	cc		ccc	rr	rr		r			rr			x				12
Actinocyclus Ralfsii																		1
Coscinodiscus excentricus																		2
Coscinodiscus lineatus																		4
Coscinodiscus janischii														rr				5
Coscinodiscus asteromphalus																		2
Coscinodiscus radiatus	rr		rr			rr				rr				x				12
Actinoptychus undulatus																		1
Cyclotella comta																		1
Leptocylindrus danicus	r							rr					rr	cc				8
Rhizosolenia stoterforthii	x	r	rr	r	x			cc	rr	rr	rr		cc	r	rr			23
Rhizosolenia alata fo. *indica*	x	c	c	x	x	rr	rr	c	rr	r	rr	rr	c	x	r	rr	rr	39
Rhizosolenia setigera		r	r	r	r	rr		rr		r	rr		c	r			rr	19
Chaetoceros peruvianus					rr			rr					r					7
Chaetoceros ditymus																		1
Chaetoceros eibenii											rr							1
Chaetoceros decipiens					rr			r		rr			x	rr				12
Chaetoceros affinis var. *Willei*																		1
Chaetoceros affinis var. *circinalis*																		3
Chaetoceros densus			rr		rr			rr			rr		rr					8
Chaetoceros mitra																		1

Chaetoceros teres																						2
Chaetoceros pseudocurvisetum																						2
Chaetoceros curvisetum																						1
Chaetoceros lorenzianus																						1
Chaetoceros brevis																						1
Bacteriastrum hyalinum																						4
Triceratium fanus	rr																					4
Dictyum Brightwellii		rr	rr																			10
Dictyum sol	x		rr	c	rr				c		r	rr			c	r						9
Biddulphia laevis	rr		rr	r					rr		rr				rr	rr						2
Biddulphia sinensis		rr	rr																			15
Biddulphia mobiliensis		rr																				8
Hemiaulus hauckii																						2
Hemiaulus chinensis																						7
Eucampia zodiacus																						1
Streptotheca thamensis																						3
Fragilaria striatula																						2
Asterionella japonica		rr			r				cc		r				ccc							7
Thalassiothrix longissima															x							1
Thalassiothrix frauenfeldii	x		x	rr			rr						rr									12
Thalassiothrix nitzschioides	x	rr	x		rr		rr		r	rr	rr	rr			r		x		rr			22
Grammatophora marina		rr																				2
Rhabdonema adriaticum																						2
Licmophora abbreviata	cc	rr	ccc	r			x	rr		rr			rr		r		x					21
Cocconeis scutellum		rr						rr	rr													1
Navicula cancellata																						11
Pleurosigma Normanii																						1
Pleurosigma affine		rr																				8
Bacillaria paradoxa				rr							rr											10
Nitzschia longissima	r	rr							r						rr							8
Nitzschia seriata					x										rr							5
Nitzschia delicatissima															rr							1
Number of species found	12	14	13	11	11	8	3	13	4	10	9	3	17	10	3	2	3					

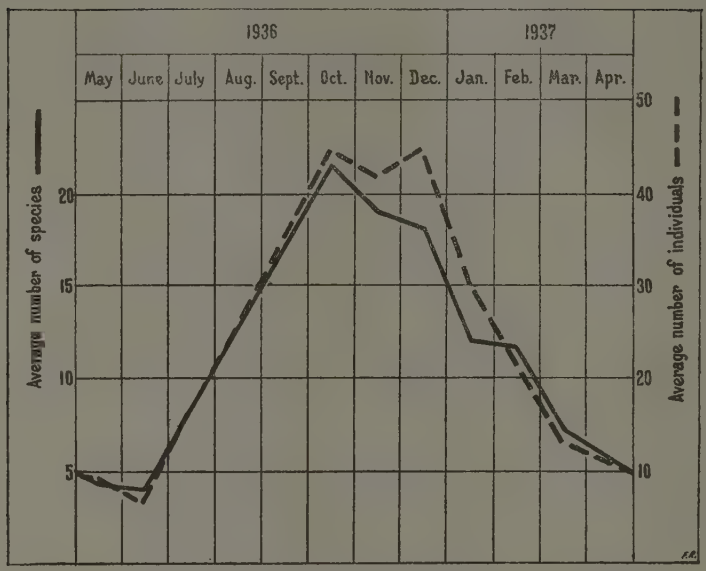

FIG. 1. Average number of species and individuals found in each collection.

6. The net used in collecting diatoms was important, as is shown clearly in Ling & Su's Nos. 24 and 25 (from 4 to 6 P. M., March 1, 1937), 26 and 27 (7 to 8.30 P. M., March 1, 1937), and 29 and 30 (10 to 12 A. M., March 12, 1937). The number of species collected by the fine net was four times as great as that taken with the ordinary net. Therefore, with the use of a fine net the number of species obtained would be far greater than the number of species reported here.

ILLUSTRATION

TEXT FIGURE

FIG. 1. Average number of species and individuals found in each collection.

MARINE PLANKTONIC DIATOMS FROM CHINA COAST

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The planktonic diatoms listed in the present paper were collected from Shantung and Fukien Coast. Twelve samples were collected, containing 105 species of diatoms, 24 of them new for China Coast. Four species were recorded from brackish water, which were not unreasonably found in the coastal sea water. The new and rare species found in the samples mentioned below will be described later.

Samples 6 to 11 were collected by a small fishing boat. The time devoted to each trip was probably very short, and therefore yielded very few species of diatoms. Sample 13 contains numerous species, probably because the collecting trip was made in August, when diatoms are abundant.

Sample 1.—Collected from Chefoo, Shantung, July 11, 1936. Seventeen species of diatoms were obtained. The number of individuals for each species was very small, since the zoöplankton was predominant in July in Shantung region.

Sample 2.—Collected from Wha Hai Wha, Shantung, July 14, 1936. Fourteen species of diatoms were obtained on this trip, under conditions very much like those obtaining at the collection of sample 1.

Sample 3.—Collected from White Shore on the eastern side of Haitan Island, and north of the Ox Mountain Light House, at 2.30 to 3 P. M., May 24 and 25, 1937. Where the water was clear, the temperature was 23° C., the transparency 17 feet, and the density 1.0214. Thirty-seven species were collected, and the number of individuals was relatively large.

Sample 4.—Collected near Green Isle, on the eastern shore of Haitan Island, May 6 and 9, 1936. Sixteen species were observed.

Sample 5.—Collected from Ox Mountain Light House, Haitan, at 2.30 to 3 P. M., May 11 and 12, 1937. Where the water was clear, the temperature was 22.1° C., the transparency 18.5 feet, and the density 1.0215. Ten species were found.

Sample 6.—Collected in a fishing ground on the eastern side of Amoy Light House, Amoy, April 25, 1936. In this sample zoöplankton was predominant, mostly Noctiluca and Copepoda. Very few individuals were found of diatoms belonging to 14 species.

Sample 7.—Collected in the Wang Yu, *Othonias undovittatus* (Jordan & Seale) fishing ground, south of Quamoy Island, Amoy, May 6, 1936. Noctiluca was predominant. Only 9 species of diatoms were recorded.

Sample 8.—Collected in the disc fish, *Evynis cardinalis* (Lacepede) fishing ground, east of Tung Ting Light House, Amoy, May 27, 1936. Only 3 species were obtained.

Sample 9.—Collected in the White Chang Yu, *Stromateus argenteus* (Euphrasen) fishing ground, June 6, 1936. The collecting ground of this sample was very near Tung Ting Light House. Ten species were found.

Sample 10.—Collected between Amoy and Formosa, November 27, 1936. Twelve species were found.

Sample 11.—Collected in front of Amoy Light House, January 15, 1937. Four species were obtained.

Sample 12.—Collected between Amoy and Kulangsu Island, in 1932. Twenty-six species were recorded.

Sample 13.—Collected from Tungsan Island, south of Amoy, August 31, 1936. Numerous diatoms were found, belonging to 55 species.

DIATOMS FOUND

MELOSIRA MONILIFORMIS (Müll.) Agardh.

Found in samples 4 and 12. Reported from Amoy by Chin.

MELOSIRA JUERGENSI Agardh.

Found in sample 4. Reported from Amoy.

PARALIA SULCATA (Ehr.) Cleve.

Found in samples 3, 5, 6, 7, 8, 10, and 13. Reported from Amoy and Tsingtao by Chin.

PODOSIRA STELLIGER (Bail.) Mann.

Podosira stelliger (Bail.) Mann, HUSTEDT (1928) 286, fig. 128.

Found in sample 3. Reported from Foochow by Skvortzow.

STEPHANOPYXIS TURRIS (Grev. & Arn.) Ralfs.

Found in sample 2. Reported from Tsingtao.

STEPHANOPYXIS PALMERINA (Grev.) Grunow.

Found in samples 10 and 13. Reported from Amoy and Tsingtao.

SKELETONEMA COSTATUM (Grev.) Cleve.

Found in sample 13. Reported from Amoy and Tsingtao.

ACTINOCYCLUS EHRENBERGI Ralfs.

Actinocyclus Ehrenbergi Ralfs, HUSTEDT (1929) 525, fig. 298.

Found in samples 3 and 12. Reported from Ningpoo by Petit.

THALASSIOSIRA NORDENSKIOLDI Cleve.

Thalassiosira nordenskioldi Cleve, LEBOUR (1930) 57, fig. 29.

Found in sample 13. First record for China Coast.

COSCINODISCUS NOBILIS Grunow.

Coscinodiscus nobilis Grunow, ALLEN & CUPP (1935) 118, fig. 13.

Found in samples 3 and 12. First record for China Coast.

COSCINODISCUS RADIATUS Ehrenberg.

Found in samples 1, 3, 4, 6, 8, 9, 11, and 12. Reported from Tsingtao.

COSCINODISCUS ASTEROMPHALUS Ehrenberg.

Found in samples 2, 6, 7, 10, 12, and 13. Reported from Amoy and Tsingtao.

COSCINODISCUS EXCENTRICUS Ehrenberg.

Found in samples 1, 2, 3, 5, 6, 11, 12, and 13. Reported from Amoy and Tsingtao.

COSCINODISCUS LINEATUS Ehrenberg.

Found in samples 1, 3, 4, 6, 7, 12, and 13. Reported from Amoy and Tsingtao.

COSCINODISCUS JANISCHII A. Schmidt.

Found in samples 3, 5, and 12. Reported from Amoy and Tsingtao.

COSCINODISCUS JONESIANUS (Grev.) Oster.

Coscinodiscus Jonesianus (Grev.) Oster., ALLEN & CUPP (1935) 116, fig. 10.

Found in samples 3, 12, and 13. First record for China Coast.

COSCINODISCUS MARGINATUS Ehrenberg.

Coscinodiscus marginatus Ehrenberg, ALLEN & CUPP (1935) 115, fig. 7.

Found in sample 12. Reported from China Sea by Hutton.

COSCINODISCUS CURVATULUS Grunow.

Found in sample 12. Reported from Amoy.

COSCINODISCUS SUBTILIS (Ehr.) Grunow.

Coscinodiscus subtilis (Ehr.) Grunow, V. H. (1896) 532, pl. 34, fig. 901.

Found in sample 2. First record for China Coast.

PLANKTONIELLA SOL (Wall.) Schuett.

Found in sample 4. Reported from Amoy.

CYCLOTELLA COMTA (Ehr.) Kützing.

Found in samples 3, 12, and 13. Reported from Amoy.

CYCLOTELLA STRIATA (Kütz.) Grunow.

Found in samples 12 and 13. Reported from Amoy and Tsingtao.

CYCLOTELLA STYLORUM Bright.

Cyclotella stylorum Bright, HUSTEDT (1928) 348, fig. 179.

Found in sample 2. First record for China Coast.

ACTINOPTYCHUS UNDULATUS (Bail.) Ralfs.

Found in samples 1, 2, 3, 4, 6, 7, and 13. Reported from Amoy and Tsingtao.

ASTEROMPHALUS FLABELLATUS Greville.

Asteromphalus flabellatus Greville, HUSTEDT (1928) 498, fig. 279.

Found in sample 3. First record for China Coast.

CORETHRON PELAGICUM Brun.

Found in samples 1, 3, 6, and 13. Reported from Amoy.

CORETHRON HYSTRIX Hensen.

Found in samples 7, 10, and 13. Reported from Amoy.

LAUDERIA ANNULATA (Cl.) Castr.

Lauderia annulata (Cl.) Castr., ALLEN & CUPP (1935) 124, fig. 25.

Found in sample 12. Reported from Hongkong by Greville.

LAUDERIA BOREALIS Gran.

Lauderia borealis GRAN (1927) 23, fig. 22.

Found in samples 3, 5, and 13. Reported from Hongkong by Lauder.

GUINARDIA FLACCIDA (Castr.) Peragallo.

Guinardia flaccida (Castr.) Peragallo, ALLEN & CUPP (1935) 125, fig. 28.

Found in sample 13. First record for China Coast.

RHIZOSOLENIA SETIGERA Brightwell.

Found in samples 6, 9, and 12. Reported from Amoy and Tsingtao.

RHIZOSOLENIA STOTERFORTHII H. Peragallo.

Found in samples 2 and 13. Reported from Amoy and Tsingtao.

RHIZOSOLENIA ALATA fo. INDICA (Perag.) Oster.

Found in samples 1, 2, 9, and 13. Reported from Amoy and Tsingtao.

RHIZOSOLENIA ALATA fo. GENUINA Gran.

Found in sample 13. Reported from Amoy.

RHIZOSOLENIA ALATA fo. GRACILLIMA (Cl.) Grunow.

Rhizosolenia alata fo. *gracillima* (Cl.) Grunow, ALLEN & CUPP (1935) 131, fig. 44.

Found in sample 13. First record for China Coast.

RHIZOSOLENIA ROBUSTA Norm.

Found in sample 13. Reported from Amoy.

RHIZOSOLENIA CALCAR AVIS M. Schultze.

Found in samples 9 and 13. Reported from Amoy.

RHIZOSOLENIA ACUMINATA (Perag.) Gran.

Found in samples 9 and 13. Reported from Amoy.

RHIZOSOLENIA IMBRICATA var. SHRUBSOLII (Cl.) V. Heurck.

Found in samples 3 and 13. Reported from Amoy.

CHAETOCEROS COARCTATUS Lauder.

Found in samples 3, 5, 6, 7, 9, and 12. Reported from Amoy.

CHAETOCEROS EIBENII (Grun.).

Found in samples 1, 3, and 9. Reported from Amoy and Tsingtao.

CHAETOCEROS AFFINIS Lauder.

Found in samples 3, 5, 10, and 13. Reported from Amoy.

CHAETOCEROS PSEUDOCURVISETUM Manguin.

Found in sample 13. Reported from Tsingtao.

CHAETOCEROS DENSUS Cleve.

Found in sample 13. Reported from Tsingtao.

CHAETOCEROS PERUVIANUS Brightwell.

Found in sample 13. Reported from Amoy and Tsingtao.

CHAETOCEROS COMPRESSUS Lauder.

Chaetoceros compressus Lauder, ALLEN & CUPP (1935) 138, fig. 60.

Found in sample 13. Reported from Hongkong by Lauder.

CHAETOCEROS PELAGICUS Cleve.

Chaetoceros pelagicus Cleve, LEBOUR (1930) 137, fig. 100.

Found in samples 9 and 13. First record for China Coast.

CHAETOCEROS BOREALIS Bail.

Found in sample 13. Reported from Amoy.

CHAETOCEROS LORENZIANUS Grunow.

Found in sample 13. Reported from Tsingtao.

CHAETOCEROS DECIPIENS Cleve.

Found in samples 9 and 10. Reported from Amoy and Tsingtao.

BACTERIASTRUM HYALINUM Lauder.

Found in samples 3, 5, 12, and 13. Reported from Amoy.

TRICERATIUM FAVUS Ehrenberg.

Found in samples 3, 12, and 13. Reported from Amoy and Tsingtao.

ACTINOPTYCHUS ANNULATA (Wall.) Grunow.

Found in sample 3. Reported from Amoy.

CERATAULINA BERGSONII H. Peragallo.

Found in sample 13. Reported from Amoy.

DITYLIUM BRIGHTWELLII (West) Grunow.

Found in samples 3, 5, 6, 10, 12, and 13. Reported from Amoy and Tsingtao.

DITYLIUM SOL Grunow.

Found in sample 3. Reported from Tsingtao.

BIDDULPHIA AURITA (Lyng.) Brebisson.

Found in sample 12. Reported from Amoy.

BIDDULPHIA PULCHELLA Gray.

Found in sample 12. Reported from Amoy.

BIDDULPHIA SINENSIS Greville.

Found in samples 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, and 13. Reported from Amoy and Tsingtao.

BIDDULPHIA RHOMBUS (Ehr.) W. Sm.

Biddulphia rhombus (Ehr.) W. Sm., HUSTEDT (1930) 842, fig. 96, 97.

Found in sample 4. First record for China Coast.

BIDDULPHIA LEAVIS Ehrenberg.

Found in sample 4. Reported from Amoy and Tsingtao.

BIDDULPHIA MOBILIENSIS (Bail.) Grunow.

Found in samples 5 and 13. Reported from Amoy and Tsingtao.

BIDDULPHIA AURITA var. OBTUSA (Kütz.) Hustedt.

Biddulphia aurita var. *obtusa* (Kütz.) Hustedt, LEBOUR (1930) 179, fig. 139.

Found in sample 4. Reported from Foochow by Skvortzow.

BIDDULPHIA GRANULATA Roper.

Found in samples 6 and 10. Reported from Amoy.

HEMIAULUS SINENSIS Greville.

Found in sample 13. Reported from Amoy and Tsingtao.

EUCAMPIA ZODIACUS Ehrenberg.

Found in sample 13. Reported from Amoy and Tsingtao.

CLIMACODIUM FRAUENFELDIANUM Grunow.

Found in sample 13. Reported from Amoy.

STREPTOTHECA THAMENSIS Shrubs.

Found in sample 10. Reported from Tsingtao.

RHAPHONEIS AMPHICEROS Ehrenberg.

Rhaphoneis amphiceros Ehrenberg, VAN HEURCK (1936) 330, fig. 394.

Found in sample 1. First record for China Coast.

THALASSIOTHRIX FRAUENFELDII (Grun.) Cleve & Grunow.

Found in samples 3 and 13. Reported from Amoy and Tsingtao.

THALASSIOTRIX LONGISSIMA Cleve & Grunow.

Found in sample 13. Reported from Amoy and Tsingtao.

THALASSIOTHRIX NITZSCHIOIDES Grunow.

Found in samples 6, 7, and 13. Reported from Amoy and Tsingtao.

ASTERIONELLA NOTATA Grunow.

Asterionella notata GRUNOW (1927) 119, fig. 126.

Found in sample 13. First record for China Coast.

ASTERIONELLA JAPONICA Cleve.

Found in sample 13. Reported from Amoy and Tsingtao.

RHABDONEMA ADRIATICUM Kützing.

Found in sample 2. Reported from Tsingtao.

GRAMMATOPHORA MARINA (Lyn.) Kützing.

Found in sample 4. Reported from Amoy and Tsingtao.

LICMOPHORA ABBREVIATA Agardh.

Found in samples 1, 4, and 11. Reported from Amoy and Tsingtao.

ACHNANTHES BREVIPES Agardh.

Found in samples 1, 3, and 4. Reported from Amoy.

TRACHYNEIS ASPERA (Ehr.) Cleve.

Trachyneis aspera (Ehr.) Cleve, DONKIN (1870) 62, pl. 10, fig. 1.

Found in samples 1, 2, 3, 4, and 12. First record for China Coast.

DIPLONEIS SMITHII (Berg.) Cleve.

Diploneis smithii (Berg.) Cleve, DONKIN (1870) 6, pl. 2, fig. 5.

Found in sample 1. Reported from Ningpoo by Petit, and from Foochow and Dairen by Skvortzow.

NAVICULA CRABRO (Ehr.) Kützing.

Navicula Crabro (Ehr.) Kützing, DONKIN (1870) 64, pl. 7, fig. 1.

Found in samples 1 and 12. First record for China Coast.

NAVICULA LONGA Greg.

Navicula longa Greg., DONKIN (1870) 55, pl. 8, fig. 7.

Found in samples 2 and 3. Reported from Ningpoo and Nimrod Sound by Petit.

NAVICULA PRAETEXTA Ehrenberg.

Navicula praetexta Ehrenberg, DONKIN (1870) 10, pl. 2, fig. 1.

Found in sample 1. First record for China Coast.

NAVICULA SPECTABILIS Greg.

Navicula spectabilis Greg., DONKIN (1870) 12, pl. 2, fig. 5.

Found in sample 1. First record for China Coast.

NAVICULA INTERRUPTA Kützing.

Navicula interrupta Kützing, DONKIN (1870) 47, pl. 7, fig. 2.

Found in sample 13. First record for China Coast. Brackish-water species.

NAVICULA CANCELLATA Donkin.

Found in sample 3. Reported from Amoy and Tsingtao.

AMPHORA OSTREARICA Brebisson.

Amphora ostrearica Brebisson, VAN HEURCK (1896) 139, pl. 1, fig. 1.

Found in sample 12. First record for China Coast.

PLEUROSIGMA ANGULATUM W. Sm.

Found in samples 2, 3, 6, 7, 12, and 13. Reported from Tsingtao.

PLEUROSIGMA ANGULATUM var. STRIGOSA W. Sm.

Pleurosigma angulatum var. *strigosa* W. Sm., ALLEN & CUPP (1935) 158, fig. 108.

Found in sample 13. First record for China Coast.

PLEUROSIGMA RECTUM Donkin.

Pleurosigma rectum Donkin, ALLEN & CUPP (1935) 158, fig. 111.

Found in sample 3. First record for China Coast.

PLEUROSIGMA NORMANII Ralfs.

Found in sample 3. Reported from Tsingtao.

PLEUROSIGMA FORMOSUM W. Sm.

Found in sample 4. Reported from Amoy.

GYROSIGMA BALTICUM W. Sm.

Found in sample 1. Reported from Amoy.

SURIRELLA FLUMINENSIS Grunow.

Surirella fluminensis Grunow, ALLEN & CUPP (1935) 164, fig. 126.

Found in samples 3 and 13. Reported from Dairen and Foochow by Skvortzow.

SURIRELLA GEMMA Ehrenberg.

Surirella gemma Ehrenberg, ALLEN & CUPP (1935) 164, fig. 125.

Found in samples 3 and 13. Reported from Nimrod Sound by Petit, and Dairen by Skvortzow.

CAMPYLODISCUS (?) COCCONEIFORMIS Grunow.

Campylodiscus (?) *cocconeiformis* Grunow, ALLEN & CUPP (1935) 165, fig. 127.

Found in samples 3 and 13. First record for China Coast.

BACILLARIA PARADOXA Gmelin.

Found in samples 3, 10, and 13. Reported from Amoy and Tsingtao.

NITZSCHIA LORENZIANA Grunow.

Nitzschia Lorenziana Grunow, VAN HEURCK (1896) 405, pl. 17, fig. 572.

Found in sample 12. First record for China Coast.

NITZSCHIA PUNCTATA (W. Sm.) Grunow.

Nitzschia punctata (W. Sm.) Grunow, VAN HEURCK (1896) 384, pl. 15, fig. 491.

Found in sample 2. Reported from Ningpoo by Petit. Brackish-water species.

NITZSCHIA TRYBLIONELLA var. LITTORALIS Grunow.

Nitzschia tryblionella var. *littoralis* Grunow, VAN HEURCK (1896) 385, pl. 15, fig. 496.

Found in sample 1. First record for China Coast. Brackish-water species.

NITZSCHIA PANDURIFORMIS Grunow.

Nitzschia panduriformis Grunow, VAN HEURCK (1896) 386, pl. 15, fig. 500.

Found in sample 3. Reported from Ningpoo by Petit, and from Dairen by Skvortzow.

NITZSCHIA DELICATISSIMA Cleve.

Found in sample 13. Reported from Tsingtao.

NITZSCHIA LONGISSIMA (Breb.) Gran.

Found in samples 10 and 13. Reported from Amoy and Tsingtao.

NITZSCHIA SERIATA Cleve.

Found in sample 13. Reported from Amoy and Tsingtao.

NITZCHIA CLOSTERIUM (Ehr.).

Nitzschia closterium (Ehr.), LEBOUR (1930) 212, fig. 179.

Found in sample 4. First record for China Coast.

BINARY, BINOMIAL, AND BIVERBAL NAMES

By C. X. Furtado

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From time to time botanists are called upon to decide whether or not certain specific names are binary or binomial within the meaning of the International Rules of Botanical Nomenclature, edition 1935. Some nomenclaturists would reject as not binary such names as *Asplenium Trichomanes dentatum* L. (1753), *Impatiens noli tangere* L. (1753), *Adiantum capillus veneris* L. (1753), *Strychnos nux vomica* L. (1753), *Xanthophytum Johannis Winkleri* Merr. (1937), and *Tibouchina Campos Portoi* Brade (1938), because the names are composed, in each case, of three separate words [1] but others do not agree to this rejection. This division of opinion among botanists upon so fundamental a point has been productive of many debates and contrary proposals, none of which have brought us nearer to a final decision.

If *Asplenium Trichomanes dentatum* L. (1753) and *A. Trichomanes ramosum* L. (1753) are not binary names, the proposal to reject them, put forward at the last Botanical Congress (1935), was not in order; for these are specific names, and the rule is that nonbinary specific names are invalid (Articles 27, 67, and 68); and consequently, such names have no status under the Rules and no claim to recognition can be made for them. If, however, the names cited are binary, the proposal to reject them, put forward at the Congress, was not given the consideration due to it from the legislative body at that Congress.

Actually, however, both interpretations are possible, because the definition of the term "binary," according to the way it has been used in the Rules and currently employed by taxonomists, is equivocal. In some instances it is used with the meaning biverbal; in other instances it is used with the meaning binomial or binary (all as defined below). Obviously, then, the first step to be taken in this matter must be to define unequivocally the terms, binary, binomial (or binominal), and biverbal, by restricting the use of the terms as follows:

[1] See also Sprague, Synopsis of Proposals, Amsterdam Congress (1935) 75, App. V.

A name is biverbal when it consists of two distinct words; it is binary when it refers to two valid descriptions, one generic and the other specific (under certain circumstances it is possible to combine these two descriptions—Article 43) ; and it is binomial (or binominal) when it consists of two appellations or epithets, each referring to one valid description of which neither of the appellations or epithets forms a part.

To be valid a specific name must, therefore, be a binary binomial, and usually a biverbal (Article 27).

The Linnæan system of nomenclature as promulgated in 1753 was essentially binary and binomial, and generally, though not universally, biverbal. Owing, however, to the efforts made by Linnæus himself and others subsequent to the publication of Species Plantarum (1753) to make the system also essentially biverbal, the three fundamental characteristics of the system were soon overlooked, and the terms biverbal, binary, and binomial came to be employed equivocally as if they were, in every case, interchangeable. This is unfortunate, as it leads to many erroneous conclusions and causes uncertainty in the application of the Rules. It is therefore desirable to adopt definitions that will emphasize the triple aspect of modern botanical nomenclature. In proposing the above definitions for wider acceptance I have kept this purpose in view.

EXAMPLES

Rumphius's Herbarium Amboinense is invalid under the Rules because it was published before 1753 (Article 20). Had it been published after 1753, *Limo decumana* Rumph. would have been classed as a biverbal name of the unitary class, because it refers to only one description, namely, the specific description. Similarly, neither *Villebrunnea integrifolia* Gaud. nor *V. crenulata* Gaud. (1844 to 1866) can be called a binary or binomial, because individually they refer to only one valid description, namely, that of a species, there being, at the time of publication of these biverbals, no valid description of a genus known as *Villebrunnea!* Both the biverbal names must, therefore, be classed among the unitary names of species.

On the other hand, *Apocynum foliis Androsaemi* L. (1753), cited in Article 68 as an example of a nonbinary name, is a binary binomial according to the definitions given above, although it is not a biverbal: it belongs to the same category of the triverbal specific names as *Adiantum capillus veneris* L. (1753)

and *Impatiens noli tangere* L. (1753) whose specific epithets, though biverbal when originally published, have now to be transformed, under the provisions of Article 27, into univerbals by uniting or hyphening the two words in each of the specific epithets, so that the entire binomials may become biverbals.

The works of Linnæus published before 1753 are invalid under Article 20; but had they been published after 1753, the specific names in them would have to be included as binary, because each name refers to two descriptions, generic and specific; but because in these works there was no specific epithet quite distinct from the specific diagnosis or description, none of the specific names could have been considered as a binomial, despite the fact that some of them are biverbal.

Biverbal names given to varieties in Gandoger's Flora Europae (1883 to 1891) are binomial, because each name consists of two appellations or epithets not forming a part of any description, and each appellation or epithet refers to one invalid description; but they are not binary, because the description indicated by the second epithet is not that of a species. Gandoger's biverbal binomial names for varieties are of the same category as *Bougainvillea* "Mrs. Butt" where each name, though binomial in form, implies at least three taxonomic groups or descriptions, namely, a particular description of a variety or form called "Mrs. Butt." belonging to a particular species or hybrid (implied), which in its turn, belongs to the genus *Bougainvillea*.

BOOKS

Books reviewed here have been selected from books received by the Philippine Journal of Science from time to time and acknowledged in this section.

REVIEWS

Problems of the Pacific, 1936. Aims and Results of Social and Economic Policies in Pacific Countries. Proceedings of the Sixth Conference of the Institute of Pacific Relations, Yosemite National Park, California, 15–29 August, 1936. Edited by W. L. Holland and Kate L. Mitchell, Assisted by Harriet Moore and Richard Pyke. Chicago, University of Chicago press. 470 pp. Price, $5.

In its sixth conference held in Yosemite, California, the Institute of Pacific Relations discussed the aims and results of social and economic policies in the major Pacific countries. The monetary policy of the United States as developed by the New Dealers has favorable effects on Canadian exports, but it proved disastrous to Chinese economy where it accentuated the decline in commodity prices and the decline in national income.

There was also a discussion of Japanese trade competition in India and in the Philippines, where the Japanese drive had telling effects notably in cotton piece goods. This competition in the former country caused the closing of many cotton mills in Lancashire. At the height of this competition, Japanese trade was slightly higher than it was 15 years ago. This gain was viewed with alarm by the Western countries, notwithstanding the fact that Japan had increased her population by 20 per cent. The exaggeration of this expansion may be due to the fact that it took place in the midst of the most difficult period of the world's commercial history. To achieve it Japan had to rationalize her industries and utilize technological development. The British charged that this competition proved ruinous not only to the British and American exporters but also to the Japanese themselves because the prices were unnecessarily low. It was also held that whatever profit Japan could make in this trade was used to finance Japanese aggressive wars.

The Russian delegates, who for the first time attended the Conference, claimed that Russia has reached the stage of socialism.

an economy in which the vast majority of the means of production is socially owned. This socialism brings in its wake the establishment of a classless society in which every group has fundamentally similar economic interests.

For the preservation of peace in the Pacific area, the Soviets believe in collective security enforced by sanctions. The Japanese urgently advocated bilateral agreements for the adjustment of specific disputes; they favored the negotiation of such agreements between Russia and Japan and between Japan and China prior to any attempt at a more general agreement. The British and the Americans desired a general consultative pact and periodic conferences of the Pacific Powers to discuss possible causes of friction before these get out of control.

The last half of the book is a series of articles describing the economic and social conditions of the United States, Soviet Russia, China, and Japan. The conflicting commercial interests of these countries and the desire for raw materials on the part of Japan to feed her industries are sources of misunderstandings. In the last article the writer points to a series of treaties evolved for the maintenance of peace in the Pacific area, which were consistently violated by the unilateral action of Japan.—G. P.

1937 Bibliography of Rubber Literature (Excluding Patents). Compiled By Donald E. Cable. New York, The Rubber Age, 1938. 128 pp. Price, paper, $1; cloth, $2.

This compilation contains references to articles on rubber published in various journals during 1937. It is the third of a series of annual rubber bibliographies which was started in 1935. A cursory examination of this book reveals that the compiler spared no effort in assembling within its covers a complete list of the latest information on the subject. It opens with a table of contents, giving the different subjects, in alphabetical arrangement, into which the bibliography is divided. A list of the journals consulted follows, giving both the abbreviated and the full title and the publisher and address of each periodical. The bibliography is divided into 75 subjects or sections arranged alphabetically with cross references at the end of each section. The book continues the unique method of its predecessors in identifying references. It closes with adequate author and subject indexes. It is handy and should prove useful to those engaged in the rubber industry.—Q. A. E.

A Manual of Operating Room Procedures. By Almira W. Hoppe and Lucile M. Halverson, Assisted by the Operating Room Nursing Staff of the University of Minnesota Hospitals. Minneapolis, The University of Minnesota press, c1937. 239 pp. Loose leaf. Price, $4.

This handbook outlines systematically all the minute particulars of preparation for operation and operative procedure and emphasizes the importance of a planned, orderly conduct as essential to the safety of the patient, poise and equanimity of the surgeon, and the final success of the operation. The outline covers all operations of general, gynecological, urological, orthopœdic and ear, eye, nose, and throat surgery, and while it is essentially intended to serve as a guide to the surgical nurse, it should also be useful to the medical student and the surgical practitioner.—B. S. G.

Eat and Keep Fit. By Jacob Buckstein. New York, Emerson books, Inc., 1938. 128 pp. Price, $1.

The author has ably and concisely presented the essential facts about the body's requirements and the relation of food to health and physical fitness. The book contains valuable advice on diets for gaining or reducing weight. The presentation of the subject matter is clear and to the point. This little book can be recommended to any person who wants to know what he should eat to become fit.—I. C.

A Survey of Methods of Care, Treatment, and Training of the Feebleminded together with a Program for the Future. By C. E. A. Winslow, William Crocker, Ford, Bacon, and Davis, Inc., C. W. Munger, Frederick Law Olmsted, Lowell J. Reed, Bruce B. Robinson, Arthur H. Ruggles, Edward F. Stevens. Foreword by Frederick W. Parsons. Introduction by Franklin B. Kirkbride. Made at Letchworth Village, Thiells, New York, 1937. Utica, New York, State Hospitals press, 1937. 164 pp., illus., front.

This volume is heartily dedicated to the genius in Administration and master in planning, the late Charles Sherman Little, M.D., ScD., the pioneer who paved the way towards an almost perfect care, treatment, and training for the feebleminded.

This book records a good number of constructive and instructive ideas which are highly interesting and important for psychologists and psychiatrists. It teaches that institutions like the Letchworth Village should be "a home, a school, and a laboratory"; in it are enumerated the four primordial purposes of the institution, as follows:

To relieve the family and the community of the care of persons whose development is so arrested that they constitute a serious burden.

To limit the propagation of genetically inferior stock by segregation.

To provide humane custodial care for persons of such low grade of development.

To rehabilitate such persons under care as are capable of material improvement.

In this book is also described the developmental progress of Letchworth Village, under the untiring efforts of Charles S. Little, whose sole craving was to see that in a quarter of a century a stately institution be erected to house and rehabilitate the unfortunates whose mentalities are below par but who are normal in every respect of physical development—those who are considered by the social world to be utterly serious social burdens. It also gives a description of how and where an institution like Letchworth Village should be built.

The book is divided into five constructive parts: (1) Physical plant, which describes the general physical plan, architecture, sanitation, mechanical equipment, and soil conditions and farming; (2) care of patients, which includes medical service, nursing service, hospital service, out-patient department service, dental service, research service, psychological service, social service work, etc.; (3) educational procedure; (4) administration; and (5) statistic and research. It is profusely illustrated.

—F. S. S. M.

The Troubled Mind. A General Account of the Human Mind, and its Disorders and Their Remedies. By Harry Roberts. With Chapters on the Insanities by Margaret Nelson Jackson. London, John Murray, 1938. 284 pp. Price, 6s.

This book is a treasure chest wherein are recorded the precious surveys of the mental disorders that only a man like Dr. Harry Roberts, with a vast, successful experiences behind him, can competently write on to guide not only the psychiatrists but also the general reader. Doctor Roberts expresses his ideas on the unfavorable and varied circumstances that the human mind has to undergo in this modern era. He deals with the various known mental diseases of both children and adults, their causes, and methods of rational treatment. He holds the view that mental diseases are like other somatic diseases which lend themselves to treatment. He tries to efface the erroneous conception deeply rooted in the minds of mankind that once an insane, always an insane, by the process and aid of psychoanalysis and psychotherapy.

The author divides the book into two comprehensive halves. In the first half he dexterously begins with the "mind," defining it and enumerating its functions. The subconscious mind, its complexes and conflicts, and the emotions and their sublimations are discussed in detail. He includes a discussion of the primal urges of mankind.

In the second half he and M. N. Jackson discuss the insanities and their various types and remedies.

Margaret Nelson Jackson closes the book with chapters on the psychoses, their inheritance and predisposing causes, such as intoxication, infections, exhaustion, age, and sex. She described in detail the manic-depressive states, schizophrenia (cleavage of the personality), persecution mania of the paranoid reaction, the syphilitic psychoses, drug addictions, mental deterioration, and mental disorders due to endocrine disfunctions. She mentions the treatment of neuroses by psychoanalysis and suggestion and of psychoses by psytherapy, sedative methods, and occupational therapy. She dwells on the mental defectives, their classification, clinical types, predisposing causes, and treatment. She closes her discussion with a statement on guards of the mentally sick.—F. S. S. M.

Childless. By Sam Gordon Berkow. New York, Lee Furman, Inc., 1937. 307 pp. Price, $3.

One is likely to judge superficially a book with a title such as this one. A perusal of its contents, however, convinces the reader that the author is guided by the most serious of motives. He treats the subject scientifically, without forgetting that the book is designed chiefly for lay readers numbering about 2,000,000 childless couples in America alone, who need badly the information which it gives. The discussion of the so-called safe period theories is critical but sound. The fairly comprehensive bibliography at the end shows not only the thorough manner in which the author prepared himself before writing the book but it is a very useful guide to readers who may wish further light on any particular phase of the broad subject of sterility or childlessness.—C. R.

Sick Children: Diagnosis and Treatment. A Manual for Students and Practitioners. By Donald Paterson. London, Cassell and company, Ltd., 1938. 3d. ed. 604 pp., illus. Price, 12s. 6d.

The first five chapters of this book deal with elementary knowledge of the attributes of the normal infant and the abnormalities that are met with in this period of life; the diseases and injuries

that follow birth; the care and feeding of the premature infant; the feeding of the normal infant and the child; and the diseases of nutrition.

The discussion of the diseases of the various organs and systems are taken up in turn in the succeeding chapters. Each of the diseases taken up is briefly but concisely discussed. Etiology with its contradicting views is given but a passing mention. Only the fundamentals of the pathology of each disease is given. The clinical picture of each disease as essential to the main purpose of the book, that of its diagnosis and treatment, is emphasized and treated in detail.

The last chapters are devoted to discussions on tuberculosis, rheumatism, diabetes, intestinal parasites (worms), and syphilis in childhood. The main features of the discussion on the diseases of the organs and systems are the presentation of the clinical picture of each disease in its varied forms and its treatment.

The materials taken up in this book are well condensed and simply treated. The book is a handy reference and can be easily understood. The beginner in pediatrics this book will prepare and initiate into a more comprehensive understanding of the detailed works on the subject; the busy practitioner with his few hours to spare it serves as a ready reference. The field nurse in charge of infant hygiene can use it as a constant guide in her daily work. The book contains many plates and illustrations. The references cited in the text further enhance its value.—J. A.

RECEIVED

A. S. T. M. standards on petroleum products and lubricants. Prepared by Committee D–2 on petroleum products and lubricants. Methods of testing specifications, definitions, charts, and tables. Philadelphia, American society for testing materials, October, 1938. 311 pp., illus. Price, $2.

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ERRATA

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Page 255, line 20, for *Elmer 13931* read *Elmer 13531.*

Page 259, cancel line 29.

Page 260, line 20, *for* 5 to 6 cm long *read* 5 to 6.5 cm long.

Page 271, insert the following diagnosis of *Anisoptera aurea* Foxworthy: A. Curtisii Dyer similis sed stamina majora et sepala aequalia.

Page 278, at end of line 10 insert: yacal.

Page 282, lines 15 and 21, *for* Leaf. Philip. Bot. 6 *read* Leaf. Philip. Bot. 4; last paragraph, first line, *for* Basilan *read* Sibuyan; same paragraph, line 3, for *12071* read *12289.*

Page 323, line 3 from bottom, *for* Leaf. Philip. Bot. 6 *read* Leaf. Philip. Bot. 4.

Page 327, for first 3 lines *read:* Palawan, Puerto Princesa, Mount Pulgar, April, 1911, *Elmer 13123* (type); also *Elmer 12754* from same locality (isotypes in Philippine National Herbarium).

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[New names and new combinations are printed in boldface.]

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